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#### [A Study of the Impact of Cirrus Clouds on High Altitude, Long Horizontal Path Laser Transmission](#)

Dec 23, 1993 38 pages

Authors: [G. G. Koenig](#); [D. R. Longtin](#); [J. R. Hummel](#); [SPARTA INC LEXINGTON MA](#)

... environmental factors of particular concern is cirrus **clouds** which can be found at the proposed levels ... range of optical properties. Even cirrus **clouds** that have very low extinction coefficients, ... EO system is fairly long. Cirrus **clouds** with low extinction coefficients are difficult to remotely ... incomplete information about optically thin cirrus **clouds**. The problem of determining cirrus cloud physical ... compounded by the high altitude location of these **clouds**. Recently, a number of programs have been ... physical and optical properties of cirrus **clouds** because of their unique impact on the global ...

**Full Text**

#### [Project SESAMISEED. Experiments to Demonstrate the Practical Uses of Artificial Plasma Clouds in the Lower Ionosphere](#)

May 21, 1970 24 pages

Authors: [John R. Davis](#); [Derrill C. Rohlfis](#); [Frederick E. Wyman](#); [NAVAL RESEARCH LAB WASHINGTON DC](#)

... of the ionosphere by rockets and by a 7-in. gun. These **clouds** have been studied by coherent-pulse-doppler, high-frequency radar for three purposes: (a) to investigate neutral gas and magnetohydrodynamic motions in the **clouds**, (b) to investigate the role of such motions in forming the plasma **clouds** into ... , artificial, sporadic-E patches, and (c) to investigate the potential of such **clouds** for illuminating the near-over-the-horizon region and detecting small targets in that ... targets. Examples are given of earth backscatter and probable over-the-horizon aircraft echoes from cesium plasma **clouds**.

**Full Text**

#### [Observed Microphysical and Radiative Structure of Mid-Level, Mixed-Phase Clouds](#)

May 2001 190 pages

Authors: [Robert P. Fleishauer](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH](#)

Airborne measurements of six mid-level **clouds** observed over the Great Plains of the United States in late ... streams. Data show that these innocuous looking **clouds** display complicated microphysical and thermodynamic structures. ... are multi-layered systems. Of particular note, in single-layered **clouds**, there is an increase of liquid water content with ... lack of temperature inversions in these mid-level **clouds** is a major difference from the thermodynamic structure of most stratocumulus ... the best discriminator of cloud interfaces for mid-level **clouds**, with 1-2 C differences between ambient and cloud ...

**Full Text**

#### [Hyperspectral Atmospheric Compensation Through Clouds and Aerosols with Physics-Based Radiative Transfer Algorithms](#)

Jan 1998 10 pages

Authors: [Thomas R. Caudill](#); [Gail P. Anderson](#); [Laila S. Jeong](#); [Robert P. d'Entremont](#); [Gary B. Gustafson](#); [Alexander Berk](#); [Larry S. Bernstein](#); [AIR FORCE RESEARCH LAB HANSCOM AFB MA](#)

... nearly ideal atmospheric viewing conditions. In reality **clouds** and aerosols will be important considerations for military operations. ... virtually no information about what is occurring below the **clouds**. However, the situation is different for thin cirrus **clouds** and tenuous aerosol plumes, where energy from the surface is transmitted through the obscuring ... 1 (^30% additional extinction due to thin **clouds** or aerosols) with appropriate S/N ratios will increase the effective ... algorithms can be used to quantify the effect of **clouds**/aerosols on system performance. In particular, new ...

**Full Text**

#### [Implications of the Khrgian-Mazin Distribution Function for Water Clouds and Distribution Consistencies With Aerosols and Rain](#)

Dec 6, 1991 200 pages

Authors: [Vernon G. Plank](#); [PHILLIPS LAB HANSCOM AFB MA](#)

... the Khrgian-Mazin (KM) distribution function for water **clouds** are discussed. The equations for the number concentration, cross-sectional ... lidar distribution equations are presented that specify the detectability of **clouds**, in general and for natural cloud types, ... also presented that is undoubtedly the first to be developed for water **clouds**. Truncation effects, primarily involving instruments that ... Composite distribution equations for aerosols plus **clouds** plus rain, or any combination, are described ... utility. It is concluded that the KM function for water **clouds** is highly versatile and useful and ...

**Full Text**

#### [Initialization of Clouds in the PSU/NCAR Mesoscale Model Using the Air Force's Real-Time Nephelanalysis](#)

May 2002 254 pages

Authors: [Louis E. Cantrell Jr.](#); [TEXAS A AND M UNIV COLLEGE STATION](#)

... Force Weather Agency (AFWA) . MM5 is used to forecast **clouds** evolving around a stationary front along the

Texas ... the Eta model provides the framework for converting RTNEPH **clouds** to data that can be used to initialize MM5. Modifications to ... grid to which it is applied. The technique used to initialize **clouds** is called the Cloud Initialization Scheme (CIS). Cloud ... sensitive MM5 forecast cloud distributions are to the initial distribution of **clouds**. Analyzed cloud is also compared to MM5 forecast **clouds** to determine if cloud forecasts are improved using this technique, and to determine if model ...

[Full Text](#)

#### [Bubble Clouds and Surface Reverberation of Underwater Noise](#)

Jan 3, 1994 18 pages

Authors: [Andrea Prosperetti](#); [JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF MECHANICAL ENGINEERING](#)

... meeting of the Acoustical Society of America we suggested that bubble **clouds** could oscillate in collective modes that would have a significant effect on underwater sound. For example, bubble **clouds** form structures capable of oscillating at frequencies as low as a few ... grant has developed these ideas with particular emphasis on the backscattering from bubble **clouds**. We have studied the acoustic excitation of bubble cloud as ... validated by comparison with laboratory experiments conducted with artificial bubble **clouds**. The results of the work are documented in a series of papers.

[Full Text](#)

#### [An Intercomparison of Forward Calculated Albedo to Satellite Observed Albedo in Cirrus Clouds](#)

Aug 1999 117 pages

Authors: [Donald G. Shannon](#); [UTAH UNIV SALT LAKE CITY DEPT OF METEOROLOGY](#)

Cirrus **clouds** are one of the least understood components of the global climate system. The Atmospheric Radiation Measurement (ARM) program is attempting to resolve the scientific uncertainties surrounding the effects of **clouds** on global climatic change. To this end, the ARM program is compiling continuous observations of **clouds**, including cirrus microphysical properties using a diverse suite of instruments, at ... results derived from this reflectivity radiance algorithm, the effects of cirrus **clouds** on the radiation field, calculated using the microphysical properties retrieved by the ...

[Full Text](#)

#### [Investigation of Properties of High Level Cirrus Clouds and their Importance for Satellite and Aircraft Operations](#)

Dec 29, 1999 10 pages

Authors: [John Hallett](#); [NEVADA UNIV RENO DESERT RESEARCH INST](#)

... designed developed and deployed for characterizing ice and water droplets in **clouds** in the atmosphere by in situ aircraft measurement. The principle of operation depends on capture ... high resolution. Test results have been obtained in hurricane outflow, in arctic **clouds** and in aircraft contrails. Application lies in determining the optical properties of such **clouds** from the viewpoint of their influence on laser propagation and transfer of atmospheric radiation; it also lies in characterizing **clouds** in terms of their potential for enhanced aircraft icing when specific spatial distributions ...

[Full Text](#)

#### [Advanced Analysis of the Influence of Clouds, Precipitation and Surface Emissivity on DMSP/NPOESS Satellite Microwave Channels](#)

May 15, 2002 5 pages

Authors: [R. G. Isaacs](#); [ATMOSPHERIC AND ENVIRONMENTAL RESEARCH INC LEXINGTON MA](#)

... contract was for a basic research program to investigate the effects of **clouds**, precipitation and surface emissivity on microwave satellite sensors and ... databases of conventional analysis to verify the presence and amount of **clouds** and precipitation and for verification of retrieval results; the application ... data; and the assessment of the accuracy of UR techniques in the presence of **clouds**. There was no measurable decrease in the UR performance in non-precipitating cloud cases. In cases with precipitating **clouds**, the UR performance was degraded as measured by the residual, which increased with ...

[Full Text](#)

#### [Distance Functions and Geodesics on Points Clouds](#)

2005 11 pages

Authors: [Facundo Memoli](#); [Guillermo Sapiro](#); [MINNESOTA UNIV MINNEAPOLIS DEPT OF ELECTRICAL AND COMPUTER ENGINEERING](#)

... distance functions and geodesics on sub-manifolds vector  $r(\text{sup } d)$  given by point **clouds** is introduced in this paper. The basic idea is that, as shown in this paper intrinsic ... on sub-manifolds of vector  $r(\text{sup } d)$ , a computationally optimal approach. For point **clouds**, the offset band is constructed without the need to explicitly find the ... manifold, thereby computing intrinsic distance functions and geodesics on point **clouds** while skipping the manifold reconstruction step. The case of point **clouds** representing noisy samples of a sub-manifold of Euclidean space is studied as well. All the underlying ...

[Full Text](#)

#### [Cloud Phase and the Surface Energy Balance of the Arctic: An Investigation of Mixed-Phase Clouds](#)

Mar 2008 83 pages

Authors: [Kristopher J. Kripchak](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

This study examines the phase relationship (liquid versus ice) in Arctic **clouds** Although it is recognized that **clouds** are fundamental components of the surface energy balance, the nature of Arctic cloud phase is poorly understood and may ... liquid fraction as a function of observed variables. Relative to each other, single-layer liquid, ice, and mixed-phase **clouds** occurred 17.6%, 39.4%, and 42.9% of the time, respectively. The dominant role that mixed-phase **clouds** play in the surface energy balance of the Arctic was confirmed, emphasizing the need for their correct parameterization in models at ...

[Full Text](#)

#### [Propagation of High Power Pulses of 10.6 micrometers Radiation from A CO2 TEA Laser of Novel Design through Clouds Produced by Adiabatic Expansion in the Laboratory](#)

Jul 1976 99 pages

Authors: [P. F. Browne](#); [P. M. Webber](#); [UNIVERSITY OF MANCHESTER INST OF SCIENCE AND TECHNOLOGY \(UNITED KINGDOM\)](#)

... 25J pulses of duration 0.1 microsecond and beam cross section 20 per sq cm; (2) the production of **clouds** in the laboratory by adiabatic expansion of compressed gas in a 300 l glass chamber and the measurement of the

- cloud parameters (liquid water content, drop radius); (3) measurements of attenuation by such **clouds** of TEA laser pulses of the above type and also measurement of partial cloud clearing by a CW 10 ... attenuation of a collinear He-Ne beam); and (4) the theory required to understand the interaction between 10.6 micrometers radiation and **clouds** of droplets. (Author)
- Full Text**
- [Techniques for Examining Drop Size Spectra in Water Sprays and Clouds](#) Apr 1979 38 pages  
 Authors: [F. W. Skidmore](#); [R. E. Pavia](#); [AERONAUTICAL RESEARCH LABS MELBOURNE \(AUSTRALIA\)](#)  
 Qualitative comparisons have been made of water drop sampling methods for sprays and **clouds**, employing slides coated with oil, gelatin and soot. Oil-wetted and soot coated slides have been compared quantitatively when exposed in nominally identical water sprays simulating natural **clouds**. When compared with gelatin and oil-wetted slides, soot slides are more convenient to prepare, ... of the oil-wetted method are allowed for. Soot slides appear to be capable of detecting ice particles in **clouds**; quantitative calibrations relating ice impingement impressions to crystal size are required. (Author)
- Full Text**
- [Backscatter and Extinction in Water Clouds](#) Oct 1981 51 pages  
 Authors: [R. G. Pinnick](#); [S. G. Jennings](#); [Petr Chylek](#); [Chris Ham](#); [ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND WSMR NM ATMOSPHERIC SCIENCES LAB](#)  
 Atmospheric **clouds** can adversely affect the operation of military electro-optical systems, particularly under slant path scenarios. The probing of **clouds** by the lidar technique, in which a short pulse of laser radiation scattered backwards by the cloud droplets is detected, is attractive for two ... ) with Mie calculations of extinction and backscatter coefficients based on 156 measurements of cloud droplet spectra in cumulus and stratus type **clouds**. The relation suggests that visible or near-infrared extinction coefficients in a cloud of unknown type could be inferred from lidar backscatter ...
- Full Text**
- [The Numerical Simulation of Marine Boundary Layer Clouds](#) 1993 3 pages  
 Authors: [Harold D. Orville](#); [SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY RAPID CITY](#)  
 The primary objectives of the research are to numerically simulate stratus, stratocumulus, and cumulus **clouds** in the marine boundary layer. This included the formation, evolution, and dissolution of the **clouds** and the area covered, then the change from one type convection and the formation of cloud streets could be ... in space and time? What causes the changing depth of the boundary layer? What are its interaction with the **clouds** in and out of the boundary layer? A third objective is to compare various numerical models among themselves ...
- Full Text**
- [Radiative Characteristics of Clouds Measured from Satellites](#) Dec 22, 1994 61 pages  
 Authors: [Donald P. Wylie](#); [WISCONSIN UNIV-MADISON SPACE SCIENCE AND ENGINEERING CENTER](#)  
 The significant findings reported in this paper are: (1) Cirrus **clouds** are very common and were found in 42% of the satellite data. There are seasonal changes in the locations of the most frequent cirrus which follow seasonal changes in convective **clouds**. However, very thin cirrus occurred at least 10% of the time in all areas. The diurnal cycle ... of cirrus was very small over the oceans. The diurnal cycle over land followed the diurnal cycle of convective **clouds**. (2) A large increase in cirrus and high cloud frequency was found in 1991. This cloud cover increase appeared with ...
- Full Text**
- [Microphysical Studies of Noctilucent Clouds](#) Jan 1992 7 pages  
 Authors: [Bernard Vonnegut](#); [STATE UNIV OF NEW YORK AT ALBANY](#)  
 Very little is understood about the microphysics of noctilucent **clouds**. It is not known whether the ice crystals comprising them are of cubic habit, as has been suggested, or whether they are hexagonal, as in tropospheric **clouds**. It has not been established whether the crystal habit and the crystal growth rates are influenced ... size and shape of the individual crystals determine their optical properties and therefore determine how noctilucent **clouds** interact with transmissions of electromagnetic waves. Our experiments were aimed at revealing the habit of noctilucent ...
- Full Text**
- [Bubble Clouds and their Transport within the Surf Zone as Measured with a Distributed Array of Upward-Looking Sonars](#) Sep 20, 2000 31 pages  
 Authors: [Peter H. Dahl](#); [UNIV OF WASHINGTON SEATTLE APPLIED PHYSICS LAB](#)  
 ... strength vs time and depth reveal the episodic events (of increased scattering level) lasting between 5 and 10 min caused by the passage of bubble **clouds** over the sonar. Time lags for the on-set of increased scattering at the four locations are consistent with a seaward velocity of the bubble **clouds** of order 10 cm/s, and the length scales of these bubble **clouds** in the seaward direction are inferred to be in the range 50 to 100 m. The influence of the incoming surface wave field is also discussed.
- Full Text**
- [Suppression of Marine Stratocumulus Clouds Due to Reduced Cloud Condensation Nuclei](#) Sep 2000 68 pages  
 Authors: [Neil T. Smith](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)  
 Cloud researchers have documented a variety of processes at work in the formation and dissipation of **clouds** in the marine boundary layer (MBL). Cloud rifts occasionally mark a distinct exception to the continuity and broad coverage more commonly observed with these **clouds**. A possible explanation for the presence of large features of broken cloudiness embedded in stratocumulus is the ... rift were only 1/6 that observed below the background stratocumulus. Cloud droplets in rift **clouds** were 3-5 microns larger than droplets in stratocumulus and exhibited a broader size ...
- Full Text**
- [The Feasibility of Missile Launch Detection Through Clouds Using the 589.6 nm Na Emission](#) 1999 14 pages  
 Authors: [M. Ahmadjian](#); [E. R. Huppi](#); [M. Egan](#); [D. R. Smith](#); [A. J. Ratkowski](#); [AIR FORCE RESEARCH LAB HANSCOM AFB](#)

[MA SPACE VEHICLES DIRECTORATE](#)

... indicate that emissions near 589.6 nm should be efficiently transmitted through the atmosphere and **clouds** and thus should be easily detectable by a downward-looking sensor positioned above the **clouds**. To test this concept, a visible radiometric sensor with an interference filter (and later with an atomic line resonance ... initial measurements have confirmed that a simulated rocket emission source at 589.6 nm is detectable through **clouds**. Additional measurements covering a wider range of cloud conditions and types and during daylight conditions ...

[Full Text](#)[Laser Transmission Through Simulated Cirrus Clouds](#)

2001 88 pages

Authors: [Ila L. Kolb](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSONAFB OH](#)

Since approximately 20% of the globe is covered with cirrus **clouds** at any given time, it is clear that any airborne or spaceborne system using a laser will intercept cirrus **clouds** at some point. Cirrus **clouds** contain a very complex microphysical structure that will affect laser power by scattering and reflecting it away from the intended target, thus reducing efficiency and possibly even making it ineffective. Using two thin cirrus laser transmission models, a single homogeneous cloud ...

[Full Text](#)[Versatile Element for Free-Space Dividing and Redirecting Neutral Atom Clouds](#)

Nov 28, 2005 5 pages

Authors: [I. V. Arakelyan](#); [N. Chattrapiban](#); [S. Mitra](#); [W. T. Hill](#); [MARYLAND UNIV COLLEGE PARK DEPT OF PHYSICS](#)

We introduce a tunnel lock that can be exploited to divide, delay and alter the direction of traveling **clouds** of cold atoms. This versatile free-space element is implemented by crossing two atom tunnels formed by low intensity, blue-detuned dark-hollow (Bessel mode) laser beams. We show that **clouds** of cold 87Rb atoms initially moving within one tunnel can be transferred to the other by gating the intensities ... an efficiency limited by the overlap volume. The element also can be used to divide a single cloud into smaller **clouds** each having a distinct momentum.

[Full Text](#)[Detection of Daytime Arctic Clouds using MISR and MODIS Data](#)

Mar 2006 25 pages

Authors: [Tao Shi](#); [Eugene E. Clothiaux](#); [Bin Yu](#); [Amy J. Braverman](#); [David N. Groff](#); [OHIO STATE UNIV COLUMBUS DEPT OF STATISTICS](#)

Amongst the spectral radiances available on the Moderate Resolution Imaging Spectroradiometer (MODIS) 7 are used operationally for detection of **clouds** in daytime polar regions. While the information content of **clouds** inherent in spectral radiances is familiar, the information content of **clouds** contained in angular radiances (i.e., radiances emanating to space from the same object but in different directions) is not. The Multi-angle Imaging Spectroradiometer (MISR) measures angular ...

[Full Text](#)[Project Pre-Gondola I: Lidar Observations of the Pre-Gondola I Clouds](#)

Jan 1967 82 pages

Authors: [John W. Oblanas](#); [Ronald T. H. Collis](#); [STANFORD RESEARCH INST MENLO PARK CA](#)

The report describes lidar (laser radar) observations of the dust and steam **clouds** that resulted from the Pre-GONDOLA I series of four chemical explosions made near Fort Peck Reservoir, Montana, during October-November 1966. The neodymium lidar was well able to track the **clouds** even when they became too tenuous to be seen visually or photographed. Observational data were analyzed to obtain cloud dimension, height, volume, rate of growth, volume backscatter coefficient and relative density variations.

[Full Text](#)[Aircraft Ionizing Doses and Dose Rates from Radioactive Clouds and Fallout](#)

Apr 1976 46 pages

Authors: [Rayford P. Patrick](#); [George D. Arnett](#); [AIR FORCE WEAPONS LAB KIRTLAND AFB NM](#)

Aircraft flying over surface areas contaminated by fallout from radioactive **clouds** from surface nuclear detonations accumulate ionizing doses. An investigation of this situation was accomplished, and the dose and dose rate resulting from such fly-overs are presented. The dose rates were also determined for aircraft approaching radioactive **clouds** and fallout contaminated surface areas. The results are presented in general terms, and examples are presented to illustrate the manner of applying the general results to specific situations. (Author)

[Full Text](#)[The Adjacency Effect of Clouds in LANDSAT MSS Data](#)

Jul 1, 1993 5 pages

Authors: [Robert P. D'Entremont](#); [PHILLIPS LAB HANSCOM AFB MA](#)

The objective of this study is to determine the effect of **clouds** on clear Landsat pixels that are adjacent to cloudy pixels. A partly cloudy scene over a well-defined ocean background was analyzed and the effect of **clouds** on the clear pixels as a function of cloud amount was determined. The amount of scattering that occurs is proportional to the amount of cloud edges in the vicinity, which is proportional to cloud amount. For each non-cloudy pixel, the ...

[Full Text](#)[Modeling of Cloud/Radiation Processes for Large-Scale Clouds and Tropical Anvils](#)

May 31, 1994 146 pages

Authors: [K. N. Liou](#); [Q. Fu](#); [S. Krueger](#); [J. L. Lee](#); [S. C. Ou](#); [Y. Takano](#); [UTAH UNIV SALT LAKE CITY DEPT OF METEOROLOGY](#)

This final report includes five reprints and preprints of papers associated with the modeling of cloud/radiation processes for large-scale **clouds** and tropical anvils. These papers present (1) a three-dimensional large-scale cloud model for testing the role of radiative heating and ice phase processes, (2) parameterization of the radiative properties of cirrus **clouds**, (3) discussion of the scattering and absorption properties of ice crystals in relation to numerical modeling, (4) improvements of an ice-phase microphysics parameterization ...

[Full Text](#)[Low-Frequency Resonance Scattering from Acoustically Compact Bubble Clouds](#)

Jan 22, 1996 349 pages

Authors: [Ronald A. Roy](#); [William M. Carey](#); [UNIV OF WASHINGTON SEATTLE APPLIED PHYSICS LAB](#)

... characteristic than predicted by Bragg scattering from gravity waves, i.e. there exists a large zero-Doppler component. We hypothesized that if microbubble **clouds** and plumes with void fractions greater than .0001 act

[Full Text](#) as collective resonant oscillators, then radiated noise can be produced and ... in an acoustically compact region, the mixture properties determine the radiation and scattering. We present scattering measurements from submerged bubble **clouds** which show that at the lower frequencies the resonance effect is significant, with the lowest order mode being a monopole which can be modeled ...

[Comparisons of Satellite-Derived Cloud Heights with Radar Measurements of Mid-Level,](#)

Aug 13, 2003 74 pages

[Mixed-Phase Clouds](#)

Authors: [James C. Jones](#); [COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC SCIENCE](#)

[Full Text](#) ... from the 10.7 micrometers channel of Geostationary Operational Environmental Satellite-8 are converted to cloud top height (CTH) for comparison to 95 GHz radar measurements of mid-level, mixed-phase **clouds**. CTH is objectively determined by airborne cloud radar and used as ground truth. Three methods of satellite-derived CTH are compared to the radar. The black body (BB) ... from a sounding. The solution is determined iteratively using a perturbation method. Errors range from +200 m to +700 m with only a slight dependence on the opaqueness of the cloud until the **clouds** become very optically thin.

[Laser Transmission Through Cirrus Clouds](#)

May 31, 2004 5 pages

Authors: [Kuo-Nam Liou](#); [CALIFORNIA UNIV LOS ANGELES](#)

[Full Text](#) ... models based on the successive-order-of-scattering approach for the computation of airborne high-energy laser transmission and backscattering through homogeneous and inhomogeneous thin cirrus **clouds** in both plane-parallel and spherical geometries. These models took into account the relative positions of aircraft, target, and cirrus **clouds** in the atmospheres. We investigated the sensitivity of laser transmission and backscattering on variation of the cloud optical depth, particle size, and cloud-base height, ...

[Structure in Small Molecular Clouds: Pedestals and Clumping](#)

Aug 1990 23 pages

Authors: [Loris Magnani](#); [John M. Carpenter](#); [Leo Blitz](#); [Namir E. Kassim](#); [Biman B. Nath](#); [NAVAL RESEARCH LAB WASHINGTON DC](#)

[Full Text](#) Observations of wings or pedestals from three regions in high-latitude molecular **clouds** are presented in order to determine the morphology and physical conditions of the gas responsible for this phenomenon. High-sensitivity spectra along 10-25 lines of sight in each ... of the bipolar outflows, the energy required to drive the outflow comes from a young stellar object; in contrast, it is virtually certain that the small molecular **clouds** studied in this paper do not contain any low-mass star formation sites. The data indicate that the pedestal emission is optically thick. Large velocity gradient ...

[Classification of Polar Stratospheric Clouds Using LIDAR Measurements From the SAGE](#)

Jun 2007 36 pages

[III Ozone Loss and Validation Experiment](#)

Authors: [Jr. Felton Melvin A.](#); [Thomas A. Kovacs](#); [Ali H. Omar](#); [Chris A. Hostetler](#); [ARMY RESEARCH LAB ADELPHI MD](#)

[Full Text](#) ... measurements from the stratospheric aerosol and gas experiment (SAGE) III ozone loss and validation experiment (SOLVE) have been used to identify classes of polar stratospheric **clouds** (PSCs) and their corresponding characteristics. Volume backscatter at 532 nm (Beta532) and 1064 nm (Beta1064), scattering ratio at 532 nm (R532) ... > 2 and delta(a) < 0.025), and II (532 > 7 and delta(a) > 0.1). In addition, a cluster predominantly found on the outside edges of **clouds**, which does not fit the definition of these PSCs, which has low R532 and delta(a) values, was found. The clustering analysis of PSC ...

[Extensible 3D \(X3D\) Graphics Clouds for Geographic Information Systems](#)

Mar 2008 101 pages

Authors: [Darren W. Murphy](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

[Full Text](#) This research evaluates the production of three dimensional (3D) **clouds** for geospatial viewing programs such as Google Earth, NASA World Wind, and X3D Earth. This thesis took advantage of iso-standard X3D graphics and X3D Edit in conjunction with manually produced image textures to represent 3D **clouds**. While a 3D geospatial viewing might never completely characterize the current state of the atmosphere, a sufficiently realistic virtual 3D rendering can be created to present current sky coverage given adequate satellite and ...

[Solid Fuel-Gaseous Oxygen Reaction Techniques for Producing High Altitude Barium](#)

Jan 1972 26 pages

[Vapor Clouds](#)

Authors: [Jr. Allen Edward F.](#); [Philip E. Beaudoin](#); [SPACE DATA CORP TEMPE AZ](#)

[Full Text](#) The program was conducted to develop superior techniques for producing barium vapor **clouds** at high altitudes using sounding rockets. Several possible vapor production reactions are considered and thermochemical computations are performed comparing achievable efficiencies of yielding free barium at high temperatures. Several prime candidate reactions are evaluated for safety in use and practicality in reactor design. A reactor has been designed for future implementation. Thermochemical computations, ground test results and preliminary flight test observations indicate a large increase in ...

[The Collapse of Interstellar and Intergalactic Gas Clouds](#)

Oct 1968 11 pages

Authors: [D. McNally](#); [DEFENSE NUCLEAR AGENCY KIRTLAND AFB NM TECHNOLOGY AND ANALYSIS DIRECTORATE](#)

[Full Text](#) The problem covered by this contract was that of star formation through the collapse of interstellar gas **clouds** under their own self-gravitation. This is not a new idea in the field of star formation as the idea can be traced back at least as far as Laplace. However, the problem had only been considered for simplified conditions which were unrealistic, and which probably in no small measure contributed to two of the major difficulties (fragmentation and angular momentum) encountered by the theory. The aim of the present work was to apply numerical methods to the problem to find out if the ...

[Modern Methods for the Artificial Dissipation of Fog and Low Clouds and Experience in](#)

[Using These Methods for Aviation Purposes](#)

May 28, 1972 15 pages

Authors: [I. I. Gayvoronkiy](#); [L. I. Krasnovskaya](#); [A. D. Soloyev](#); [FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH](#)[Full Text](#)

The report contains reviews methods for the artificial dissipation of low-level **clouds** and fogs. A classification of dissipation methods is given. The classification was made on the basis of the physical processes capable of leading to an improvement of visibility in a fog. The classification makes it possible to analyze any modification methods by comparing them with the most characteristic methods listed in the table. It is proposed that the specific expenditures on energy (reagent) during a definite period be regarded as the principal criterion of method efficiency.

[Statistics of Electromagnetic Scattering from Chaff Clouds](#)

Apr 1975 58 pages

Authors: [Vittal P. Pyati](#); [AIR FORCE AVIONICS LAB WRIGHT-PATTERSON AFB OH](#)[Full Text](#)

Starting from first principles, the first and second order probability densities of the scattered field from chaff **clouds** are derived. Auto-correlation functions and power spectra of the received voltage, radar cross section and phase are obtained. All the mathematical derivations are explained in full detail. For the simple case of a spherically uniform distribution of relative speed of the dipoles, it is shown that an integral relation exists between the speed distribution function and the intensity auto-correlation function. The utility of second order statistics in studying the effects of ...

[Spectral Radiance of Snow and Clouds in the Near Infrared Spectral Region](#)

Nov 17, 1978 46 pages

Authors: [Francis R. Valocin](#); [AIR FORCE GEOPHYSICS LAB HANSCOM AFB MA](#)[Full Text](#)

The near infrared spectral radiance measurements of snow and cirrus and cumulus cloud backgrounds taken by the Air Force Geophysics Laboratory's flying laboratory are evaluated. From the analysis of the 124 spectra obtained, the spectral radiances or reflectance characteristics of snow and cirrus and cumulus **clouds** between 5500 and 7000/cm (1.82-1.43 micrometers) were determined. Snow/cloud discrimination can be made by utilizing a sensor in the 5500 to 7000/cm spectral region. Based on the analysis of these data, certain snow/cloud design parameters were identified; that is, slope of the ...

[Optical Extinction Coefficients Beneath Marine Stratus Clouds. Comparison of Coefficients Calculated from Observed Aerosol Spectra with Coefficients Specified by the Navy Aerosol Model](#)

May 2, 1983 32 pages

Authors: [V. R. Noonkester](#); [NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA](#)[Full Text](#)

... of wind speed, relative humidity (less than saturate), and air mass type. The capability of the model to duplicate the observed profiles below cloud base was determined. The surface model was applied to the above-surface conditions by assuming various vertical profiles of relative humidity below cloud base. Comparison of the observed and model profiles were made for various combinations of surface wind speed, humidity profiles, and air mass type. These comparisons indicated that the model could not reproduce the observed profiles of optical extinction by aerosols below marine stratus **clouds**.

[Electro-Optical Transmission and Liquid Water Content of Fogs and Clouds](#)

May 1984 13 pages

Authors: [S. G. Jennings](#); [UNIVERSITY COLL GALWAY \(IRELAND\) DEPT OF PHYSICS](#)[Full Text](#)

... two direct filtration methods, one of which employed a top loading balance. The use of a reference impaction assembly is imperative when making absolute measurements of liquid water content. The experimental assembly designed to measure simultaneously extinction coefficient and liquid water content has been completed and used. Simultaneous measurements of extinction coefficient, wavelength, and liquid water content have been successfully made, and do not closely match theoretical predictions. A new device for measuring the homogeneity of **clouds** in a cloud chamber has been developed. (Author)

[Numerical Simulation of Cirrus Clouds - Fire Case Study and Sensitivity Analysis](#)

Aug 12, 1991 142 pages

Authors: [Scot T. Heckman](#); [COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC SCIENCE](#)[Full Text](#)

... mechanisms. Sensitivity simulations were run to determine long and short wave radiative forcing. Also, a simulation was run with no condensate to examine cloud feedbacks on the environment. Cloud top generation zones, fallstreaks, and layering were simulated. Longwave radiation appeared to be instrumental in developing weak convective activity in the lower layer thereby increasing its optical depth. Cloud top cooling and cloud base heating affected the flow around the cloud. Secondly, the effects of three upper boundary conditions on cirrus **clouds** were studied in a synoptic setting.

[Multiparameter Radar and Aircraft Based Studies of the Micro-Physical, Kinematic and Electrical Structure of Convective Clouds](#)

Feb 14, 1993 15 pages

Authors: [V. N. Bringi](#); [I. J. Caylor](#); [COLORADO STATE UNIV FORT COLLINS DEPT OF ELECTRICAL ENGINEERING](#)[Full Text](#)

Ongoing studies of the microphysical kinematic and electrical evolution of two convective **clouds** observed by radar and aircraft during the Convective and Precipitation Electrification Project (CaPE) are reported. A complete life-cycle of cloud evolution from radar first echo to mature phase is documented using reflectivity (ZH) and differential reflectivity (ZDp). Aircraft data from T-28, NOAA-P3, NCAR King Air and Wyoming King Air are in the process of being analyzed for particle type, electric field from field mills and up/down draft. Surface field mills and LLP data give an indication of ...

[Uplink Laser Propagation Measurements Through the Sea Surface, Haze and Clouds](#)

Mar 1993 14 pages

Authors: [G. T. Kaye](#); [Roger Nies](#); [Michael Lovern](#); [NAVAL COMMAND CONTROL AND OCEAN SURVEILLANCE CENTER RDT AND E DIV SAN DIEGO CA](#)

... FLIP at depths of 15 to 45 m. During six nights of operations, the AOR received the laser light at various test geometries and through clear and cloudy conditions. This represents the first optical uplink cloud experiment at

visible wavelengths. Results show that optical pulses in **clouds** are significantly more forward-scattered than modeled. The results can be explained by Mie scattering theory. Measured cloud attenuation and pulse stretching agreed with an existing optical propagation model. Significant attenuation and signal spreading due to haze and fog was measured and compared with theory ...

[Full Text](#)

#### [Clouds: Their Prediction and Simulation](#)

Jun 30, 1993 12 pages

Authors: [W. R. Cotton](#); [G. L. Stephens](#); [COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC SCIENCE](#)

... events has been repeated using newly developed microphysics schemes. Boundary layer cloud fractional coverage schemes has been tested for one of the FIRE I stratocumulus cases in which there was a transition from solid stratocumulus to broken cumuli. RAMS ability to simulate ordinary deep convective **clouds** has been evaluated for one of the CaPE case over the Kennedy Space Flight Center. New modules for cloud microphysics and radiation transfer have been written and the impacts of those schemes on cloud forecasting will be evaluated in the future. Cloud prediction, Cirrus, Stratocumulus, ...

[Full Text](#)

#### [The Appearance of the Sun and Moon Seen Through Clouds](#)

Dec 1993 66 pages

Authors: [Jeffrey R. Linskens](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH](#)

The sun occasionally appears fuzzy through altostratus because altostratus is composed of larger particles than other **clouds**, and is of the necessary optical thickness. Experimental results indicate that the range of optical thicknesses of a cloud at which a fuzzy sun is seen increases with the size of the particles. This relationship is caused by an increase in the attenuation of contrast at high spatial frequencies relative to that at low spatial frequencies when the size of cloud particles increases. The increase in, the size of cloud particles is caused by the presence of raindrops and ...

[Full Text](#)

#### [Time Delay and Pulse Stretching Calculations for Laser Radiation Propagation in Clouds](#)

Apr 1, 1979 54 pages

Authors: [Dave G. Collins](#); [RADIATION RESEARCH ASSOCIATES INC FORT WORTH TX](#)

A computer study was conducted to determine the effects of multiple scattering on the time delay and stretching of a laser pulse propagating within a cloudy atmosphere. An effort was made to model the experimental setup and cloud conditions that existed during Project CLIPS conducted by Sandia Laboratories on Hawaii Island in the Fall of 1978. The scattering and extinction coefficients and the angular scattering distributions were calculated for several cloud conditions using measured cloud aerosol size distributions furnished by Light scattering, Pulse stretching, **Clouds**, Mie scattering

[Full Text](#)

#### [Temporal Effects of Shiptracks on Clouds](#)

Mar 1995 133 pages

Authors: [Andrew Brown III](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

... and optical characteristics of 27 shiptracks are analyzed using AVHRR satellite data. Channel 1 (.63um), and channel 3 (3.7um), are utilized to determine the temporal variations in shiptrack albedo and track width. In most cases, shiptracks mirror the trend of albedo changes exhibited by the ambient **clouds** in which they are formed. Under special circumstances, shiptrack albedo increases when ambient cloud albedo decreases due to cloud thinning. Shiptrack widths show uniformity of growth, with rapid growth rates of 4-6 km/hr in the near-source region, decreasing to 1-2 km/hr in the far field. ...

[Full Text](#)

#### [Acoustic Scattering from Compact Bubble Clouds](#)

Jun 1996 282 pages

Authors: [Ronald A. Roy](#); [Jeffrey A. Schindall](#); [UNIV OF WASHINGTON SEATTLE APPLIED PHYSICS LAB](#)

In this study, a simple model describing the low frequency scattering properties of high void fraction bubble **clouds** in both the free field and near the ocean surface is developed. This model, which is based on an effective medium approximation and acoustically compact scatterers, successfully predicts the results of the bubble cloud scattering experiment carried out at Lake Seneca NY for frequencies consistent with the model assumptions (Roy et al., 1992). The introduction of the surface is facilitated by the method of images is subject to the same constraint of low acoustic frequency imposed ...

[Full Text](#)

#### [Acoustical Emission from Bubbles and Dynamics of Bubbles and Bubble Clouds](#)

Jan 1997 17 pages

Authors: [Michael S. Longuet-Higgins](#); [CALIFORNIA UNIV SAN DIEGO LA JOLLA OFFICE OF CONTRACT AND GRANT ADMINISTRATION](#)

The aim of the research was to further our understanding of the natural sources of sound near the ocean surface, which are known to be due mainly to oscillating bubbles and bubble **clouds**. A theory has been given for the damping of bubble oscillations by nonlinear coupling between different modes of oscillation of a spherical bubble. Some experimental confirmation was found by later workers. A simple statistical model has been proposed for the initial bubble sizes from breaking waves, which also has received experimental support. A direct method of calculating wave-generated ripples has been ...

[Full Text](#)

#### [Experimental and Modeling Studies of Interactions of Marine Aerosols and Clouds](#)

May 31, 1997 8 pages

Authors: [Sonia M. Kreidenweis](#); [COLORADO STATE UNIV FORT COLLINS](#)

The primary goals of this research were to address the following key questions regarding marine aerosol/ cloud interactions: (1) What factors control the abundance and vertical distribution of aerosol in the marine boundary layer? (2) How do these factors affect the formation and lifetime of marine **clouds**? These questions have been addressed through a combination of modeling and experimental approaches, as described below. The goal of the modeling component was to produce a model description of aerosol evolution and aerosol / cloud interaction that can be applied to a variety of marine ...

[Full Text](#)

#### [Accounting for Clouds in Sea Ice Models](#)

Dec 1998 38 pages

Authors: [Aleksandr P. Makshtas](#); [Edgar L. Andreas](#); [Pavel N. Svyashchennikov](#); [Valery F. Timachev](#); [COLD REGIONS RESEARCH AND ENGINEERING LAB HANOVER NH](#)

Over sea ice in winter, the **clouds**, the surface layer air temperature, and the longwave radiation are closely coupled. This report uses archived data from the Russian North Pole (NP) drifting stations and recent data from Ice Station Weddell (ISW) to investigate this coupling. Both Arctic and Antarctic distributions of total cloud amount are U shaped; that is, observed cloud amounts are typically either 0-2 tenths or 8-10 tenths in the polar regions. These data obey beta distributions; roughly 70 station years of observations from the NP stations yielded fitting parameters for each winter ...

[Full Text](#)

[A Characterization of the Impact of Clouds on Remotely Sensed Water Quality](#)

Sep 17, 1999 250 pages

Authors: [Ronald R. Fairbanks](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSONAFB OH](#)

... seem to fail when used on data taken over the Laurentian Great Lakes. Two primary reasons for the failure have been identified as higher suspended minerals in the Great Lakes than in the oceans and normally higher cloud cover over the Great Lakes. A characterization of the impact of **clouds** on the radiance reaching remote sensing platforms has been performed. From this characterization, the impact on the calculated chlorophyll content determined by current algorithms is derived. The work presented here describes the creation of an end-to-end radiative transfer model for the complete ...

[Full Text](#)

[Meteoric Metals and Noctilucent Clouds: An Experimental Study of the Uptake of Sodium and Potassium Atoms on Low-Temperature Ice Films](#)

2003 16 pages

Authors: [John M. Plane](#); [UNIVERSITY OF EAST ANGLIA NORWICH \(UNITED KINGDOM\)](#)

... follows: The Grantee will investigate the kinetics of atomic Na and K uptake on both amorphous and cubic crystalline ice films, over the temperature range 100 to 150 K. The data obtained will be used in a predictive, high resolution 1- dimensional model of the upper mesosphere. Model predictions will be validated by comparison with lidar observations of the depletion of Na and K layers during the formation of noctilucent **clouds**. The results of the kinetic studies and model validation will then be published and will be provided to AFRL personnel for inclusion in mesospheric background codes.

[Full Text](#)

[Overlapping Open Clusters NGC 1750 and NGC 1758 Behind the Taurus Dark Clouds. II. CCD Photometry in the Vilnius System](#)

2003 30 pages

Authors: [V. Straizys](#); [A. Kazlauskas](#); [A. Cerniauskas](#); [R. P. Boyle](#); [F. J. Vrba](#); [NAVAL OBSERVATORY FLAGSTAFF AZ](#)

... are given for 287 stars. The classification of stars is based on their reddening-free Q- parameters. Eighteen stars observed photoelectrically were used as standards. The extinction versus distance diagram exhibits the presence of one dust cloud at a distance of 175 pc, which almost coincides with the distance of other dust **clouds** in the Taurus complex. The clusters NGC 1750 and NGC 1758 are found to be at the same distance of approximately 760 pc and may penetrate each other. Their interstellar extinction A(V) is 1.06 mag, which corresponds to E(B-V) = 0.34 mag. (3 tables, 5 figures, 10 refs ...

[Full Text](#)

[Whole Sky Imaging of Clouds in the Visible and IR for Starfire Optical Range](#)

Jul 31, 2007 67 pages

Authors: [Janet E. Shields](#); [Monette Karr](#); [Art R. Burden](#); [Richard W. Johnson](#); [William S. Hodgkiss](#); [SCRIPPS INSTITUTION OF OCEANOGRAPHY LA JOLLA CA MARINE PHYSICAL LAB](#)

... Kirtland Air Force Base under Contract N00014-01-D-043 DO #11, between 02 September 2004 and 30 April 2006. This work relates to the Air Force's need to characterize the cloud distribution during day and night, for a variety of applications, including support of research into impact of **clouds** on laser communication and support of satellite tracking. This contract followed Contract N00014-01-D-0043 DO #4, which will be discussed in Section 2, and is documented in Shields et al 2007, Technical Note 271. Under this contract, we began preparing Whole Sky Imager systems for field experiments in ...

[Full Text](#)

[Thermodynamic Feedback Between Clouds and the Ocean Surface Mixed Layer](#)

Mar 20, 1989 11 pages

Authors: [P. C. Chu](#); [Jr Garwood Roland W.](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA DEPT OF OCEANOGRAPHY](#)

A cloud-ocean planetary boundary layer (OPBL) feedback mechanism is presented and tested in this paper. Water vapor, evaporated from the ocean surface or transported by the large-scale air flow, often forms convective **clouds** under a conditionally unstable lapse rate. The variable cloud cover and rainfall may base positive and negative feedback with the ocean mixed layer temperature and salinity structure. The coupling of the simplified Kuo's (1965) cumulus cloud model to the Kraus-Turner's (1967) ocean mixed layer model shows the existence of this feedback mechanism. The theory also predicts ...

[Full Text](#)

[Particle Size Distributions in Atmospheric Clouds](#)

Mar 24, 2004 9 pages

Authors: [Roberto Paoli](#); [Karim Shariff](#); [NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MOFFETT FIELD CA AMES RESEARCHCENTER](#)

In this note, we derive a transport equation for a spatially integrated distribution function of particles size that is suitable for sparse particle systems, such as in atmospheric **clouds**. This is done by integrating a Boltzmann equation for a (local) distribution function over an arbitrary but finite volume. A methodology for evolving the moments of the integrated distribution is presented. These moments can be either tracked for a finite number of discrete populations ("clusters") or treated as continuum variables.

[Full Text](#)

[Snow and Ice Particle Sizes and Mass Concentrations at Altitudes Up to 9 km \(30,000 ft\)](#)

Aug 1998 93 pages

Authors: [Richard K. Jeck](#); [FEDERAL AVIATION ADMINISTRATION ATLANTIC CITY NJ AIRPORT AND AIRCRAFT SAFETY RESEARCH AND DEVELOPMENT](#)

... cloud intervals or other convenient distances in wintertime **clouds**, snowstorms, cirrus, and other high-altitude **clouds**. The findings are that, generally, the largest particles and the greatest concentrations of total ice particle ... upper reaches of deep winter storm **clouds** that are found at these levels. Exceptions are thunderstorm ... ,000 ft (9 km). Anvil **clouds** and stratiform **clouds** associated with warm season ... confined to

[Full Text](#)

short distances of 3 nm or less in convective **clouds**, the largest average TIPM's in glaciated **clouds** have been found in layer **clouds** over distances up to 30 nm. ...

#### [Cirrus Particle Distribution Study. Part 6.](#)

Sep 4, 1980 105 pages

Authors: [Ian D. Cohen](#); [Arnold A. Barnes Jr](#); [AIR FORCE GEOPHYSICS LAB HANSCOM AFB MA](#)

Cirriform **clouds** associated with a frontal system which passed through New Mexico on 4 and 5 April 1978 ... which has been equipped with cloud physics instrumentation by AFGL. The **clouds** sampled were thin cirrus and cirrostratus layers in ... 4 April were approximately 700 microns. On 5 April, few **clouds** could be found, but one patch yielded particles as ... time periods from each of the flights. In addition to the visible cirrus **clouds**, particles were also found in clear air between the ... Some of the sub-visible cirrus particles seemed to come from **clouds** above the aircraft, but other instances of sub-visible ...

[Full Text](#)

#### [Satellite Observations of Marine Stratus/Stratocumulus](#)

Jun 14, 1995 29 pages

Authors: [James A. Coakley Jr](#); [OREGON STATE UNIV CORVALLIS COLL OF OCEANIC AND ATMOSPHERIC SCIENCES](#)

... were performed in order to obtain the properties of low level **clouds** and the cloud free ocean background. The work led to the findings that: (1) reflectivities of broken **clouds** at both 0.63 and 3.7  $\mu\text{m}$  are smaller than those of nearby uniform **clouds** indicating that the broken **clouds** have substantially less liquid water than ... and that photons are escaping through the sides of the broken **clouds** and being absorbed by the ocean surface. (2) The ... models were unable to adequately predict low level **clouds**. The deficiency was thought to be due to the inability of the model to adequately ...

[Full Text](#)

#### [Comparison of the Naval Operational Global Atmospheric Prediction System Cloud Analyses and Forecasts With the Air Force Real Time Nephelometer Cloud Model](#)

Jun 1998 105 pages

Authors: [Gary E. Marsteller](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA DEPT OF METEOROLOGY](#)

... NOGAPS analyses for high, middle, and low **clouds** during January 1998 and October 1997. ... accurate except for in the polar regions and the low **clouds**. NOGAPS forecasts at 12, 24, 36, ... analyses compare well for high and middle **clouds**. However the RTNEPH and NOGAPS analyses are ... more occurrences for the cloudiest category (80-100%). For low **clouds** the RTNEPH and the NOGAPS are quite different, since the RTNEPH has difficulty analyzing **clouds** at night The NOGAPS and the RTNEPH (except for low **clouds**) generally agree on the clear areas. However, it appears that NOGAPS underestimates the number of ...

[Full Text](#)

#### [Optimization of MAS and MODIS Polar Ocean Cloud Mask](#)

Jun 2000 96 pages

Authors: [Sean P. Memmen](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

... ice, but with the exception of SSM/I and RADARSAT, **clouds** are a major obstacle to viewing the surface. With NASA's ... of using multi-spectral techniques to detect the presence of **clouds**. A group at the Space Science and Engineering Center ... from all tests, it is possible to detect the presence of **clouds** at different altitudes in the atmosphere. Based on the Ackerman et ... subjective analysis, the modifications greatly improved the detection of **clouds** over cold polar oceans where sub-pixel ice ... or water temperatures might falsely indicate **clouds**. The number of Cloudy pixels (<0.66 clear confidence ...

[Full Text](#)

#### [Prediction of Global Cloud Cover with a Very High Resolution Global Spectral Model](#)

Dec 29, 1992 4 pages

Authors: [T. N. Krishnamurti](#); [FLORIDA STATE UNIV TALLAHASSEE DEPT OF METEOROLOGY](#)

... a function of prevailing relative humidity. The new method explicitly predicts **clouds** as a variable of the model. Our research effort covers both avenues. The ... occur in the first 24 hours, an initialization problem. Observed **clouds** appear to exhibit more of a resilience than is demonstrated by the ... to the strong selection rules imposed by the model for the existence of **clouds**; (2) The explicit treatment of **clouds** where the cloud water mixing ratio is used as ... dependent variable of the model, appears to handle long lasting **clouds** in a more realistic manner. It does not show the rapid spin-down ...

[Full Text](#)

#### [Survey of Ship Tracks Observed by NOAA AVHRR](#)

Jul 9, 1998 4 pages

Authors: [James A. Coakley Jr](#); [OREGON STATE UNIV CORVALLIS COLL OF OCEANIC AND ATMOSPHERIC SCIENCES](#)

... the altitudes, visible optical depths, and cloud droplet effective radii for low-level **clouds**. Comparisons were made between the properties of **clouds** within 50 km of the tracks left by underlying ships in the **clouds** and those farther than 200 km from the tracks in order to ... . The results indicated that: 1) ship tracks rarely appeared in low-level **clouds** having altitudes greater than 1 km; 2) small cloud droplet sizes and ... was suggested by theory, and 3) ship tracks are more frequent when **clouds** at altitudes below 1 km were extensive and completely covered large areas, as ...

[Full Text](#)

#### [Two Years of Global Cirrus Cloud Statistics Using HIRS](#)

1991 38 pages

Authors: [Donald Wylie](#); [W. P. Menzel](#); [H. M. Woolf](#); [WISCONSIN UNIV-MADISON SPACE SCIENCE AND ENGINEERING CENTER](#)

A climatology of upper tropospheric semi-transparent cirrus **clouds** has been compiled using HIRS multispectral infrared data, ... of data analyzed (June 1989 - May 1991). Semi-transparent **clouds** were found in 36% of the observations. Large seasonal changes were found in these **clouds** in many geographical areas; large changes occur in areas ... high pressure systems, and the mid-latitude storm belts. Semi-transparent **clouds** associated with these features move latitudinally with the seasons. These **clouds** also are more frequent in the summer hemisphere than the winter hemisphere. They appear to be ...

[Full Text](#)

#### [Retrieval of Cirrus Radiative and Spatial Properties Using Independent Satellite Data Analysis Techniques](#)

1992 5 pages

Authors: [Robert P. d'Entremont](#); [Donald P. Wylie](#); [J. W. Snow](#); [Michael K. Griffin](#); [James T. Bunting](#); [PHILLIPS LAB](#)

[HANSCOM AFB MA](#)[Full Text](#)

Cirrus is one of the most poorly quantified **clouds**. As a part of International Satellite Cloud Climatology Project (ISCCP), intensive observations of cirrus **clouds** were taken in the autumn of 1986 over Wisconsin. During this First ... from satellite, aircraft, and ground-based platforms were made of cirrus **clouds**. This paper deals with the verification of cirrus cloud information, both spatial and ... to the wide variability in properties common for other types of **clouds**, cirrus **clouds** have the added complexity of transmissivity  $t$  values that span ...

[GROMET 2. Rainfall Augmentation in the Philippine Islands](#)

May 1971 135 pages

Authors: [P. St.-Amand](#); [D. W. Reed](#); [T. L. Wright](#); [S. D. Elliott](#); [NAVAL WEAPONS CENTER CHINA LAKE CA](#)[Full Text](#)

... through mid-June 1969. Pyrotechnically generated silver iodide was released in updrafts in growing **clouds**, and through judicious placement and timing of seeding events individual **clouds** were organized into larger cloud systems. Rainfall estimated as at least ... 10 to the 10th power cubic meters of water fell from seeded **clouds**. The precise extent of rainfall augmentation resulting from seeding cannot be calculated; nonetheless, rainfall augmentation from tropical cumulus **clouds** was accomplished in a simple operational manner. Benefits derived, at least in part ...

[Icing Simulation in the Aeropropulsion Systems Test Facility Propulsion Development Test Cell C-2](#)

Jan 1995 49 pages

Authors: [C. S. Bartlett](#); [ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AFS TN](#)[Full Text](#)

... has been modified to provide simulated altitude icing conditions. Spray droplet **clouds** with droplet mass median diameters simulating natural icing **clouds** are produced with calibrated water atomizing spray nozzles. The proper amount of liquid water ingested by an engine in flight through icing **clouds** is simulated by injection of the proper water content into the airstream that enters a ... of system activation testing have been summarized. The system can be used to initiate **clouds** and reach steady controlled spray operation within 10 sec. The system ...

[Monte Carlo Simulation of Detection of Cirrus Cloud Properties By Micro Pulse Lidar](#)

May 17, 1996 66 pages

Authors: [James A. Cotturone Jr](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH](#)[Full Text](#)

... study. Cloud base height and the radiative properties of cirrus **clouds** are important for determining the radiation budget of the planet. Inferred cirrus cloud radiative properties vary with the type of crystals assumed to compose the model **clouds**. To properly model optically thin **clouds**, it is important to include a standard background atmosphere composed of Rayleigh and aerosol scatterers. Its inclusion allows ... and above-cloud layer. Information that is unavailable when sampling optically thick **clouds**. This capability plays a pivotal role in an inversion algorithm that is developed ...

[An Investigation of Plume Rise from Titan IV Rocket Launches](#)

Dec 1997 193 pages

Authors: [Joseph D. Brands](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH](#)[Full Text](#)

... Vandenberg Air Force Base (vAFB) produce exhaust ground **clouds** from the solid rocket boosters and liquid hypergolic fuels containing ... drawback to the REEDM is its underprediction of the initial ground **clouds** stabilization height. This underprediction causes an overprediction of the ground level toxic substance concentrations. This thesis focused on increasing the accuracy of the **clouds** stabilization height. Therefore, a model was developed incorporating conservation ... conditions. This rate of entrainment is a critical factor in accurately predicting the rise behavior of ground exhaust **clouds**.

[Global Statistics on Cloud Optical Depths From Satellite and Lidar Observations](#)

Oct 1995 4 pages

Authors: [Donald Wylie](#); [WISCONSIN UNIV-MADISON SPACE SCIENCE AND ENGINEERING CENTER](#)[Full Text](#)

... satellite series. The High Resolution Infrared Radiometer Spectrometer (HIRS) data were used to detect **clouds** and estimate their optical depths in the 11 micron infrared window. The cloud ... uses the 13-15 micron infrared channels where partial CO<sub>2</sub> absorption occurs, to detect partially transparent **clouds** and correctly determine their altitude. This algorithm is designed to be sensitive to upper tropospheric cirrus **clouds** which are difficult to detect. The frequency of these **clouds** along with their global distribution and seasonal changes have been reported at past CIDOS conferences.

[Operation Greenhouse, Scientific Director's Report, Annex 4.1, Cloud Studies, Parts I, II, and III, Nuclear Explosions, 1951](#)

1951 181 pages

Authors: [Charles E. Anderson](#); [Philip E. Gustafson](#); [AIR FORCE CAMBRIDGE RESEARCH CENTER BEDFORD MA ATMOSPHERIC PHYSICS LAB](#)[Full Text](#)

... a requirement for detailed information on the meteorological microstructure of atomic **clouds**. This requirement arose from the speculation that radioactive material could be deposited ... cloud. More factual information was required on the properties of atomic **clouds** before definite answers could be given to these questions. ... revealed the following conclusions concerning the meteorological properties of atomic **clouds**. (1) The cloud properties depended greatly on the conditions in the environment ... content. The stems of both Dog and Easy **clouds** were found to be dry. George cloud, which was ...

[Investigation of Emissive Smoke](#)

Jun 2006 129 pages

Authors: [Robert E. Turner](#); [SCIENCE APPLICATIONS INTERNATIONAL CORP ABINGDON MD](#)[Full Text](#)

... procedure for creating a model for the description of radiation in and released from emissive smoke **clouds**, that is, **clouds** in which sources of radiation consist of the internal thermal radiation from an ambient medium ... used in realistic scenes using external atmospheric conditions and the optical and geometric properties of **clouds**, flares, targets, and a background. The model is designed to allow a wide range of parameter values to be used to quantify the physical, optical, and geometric properties of **clouds**, flares and targets, and backgrounds. The model contains simple input and output files ...

[TRANSPORT OF RADIOACTIVE DEBRIS FROM OPERATIONS BUSTER AND JANGLE](#)

Mar 15, 1952 188 pages

Authors: [Philip W. Allen](#); [Lester Machta](#); [Kenneth M. Nagler](#); [Harry L. Hamilton Jr.](#); [Lester F. Hubert](#); [WEATHER BUREAU SILVER SPRING MD](#)

**Full Text**

The main portions of the Baker and Charlie **clouds** moved south- westward to the Pacific Ocean and recurved to spread over a large portion of the United States. The Dog and Easy **clouds** spread south-eastward over the Southern states. Both JANGLE **clouds** moved north-eastward and were detected chiefly in the northern part of the country. The combination of vertical diffusion and fallout with variable low-altitude winds produced broad bands of deposition at the surface. Heaviest ...

[The ROSCOE MANUAL. Volume 27. Natural Background Radiation](#)

Jul 1, 1980 346 pages

Authors: [Daniel A. Hamlin](#); [Melvin R. Schoonover](#); [SCIENCE APPLICATIONS INC LA JOLLA CA](#)

**Full Text**

... cone with vertex at each selected altitude. The processes contributing to the radiances are emission from air, Earth's surface, and **clouds** and reflection of solar radiation from Earth's surface and **clouds**; attenuation is by molecules and aerosols. The Module integrates ROSCOE-IR models for atmosphere, atmospheric thermal emission, molecular transmittance, aerosols, **clouds**, Earth's surface characterization and radiances, solar radiation, and upwelling natural radiation. The last 3 models are documented fully; ...

[Specification of Cloud Amount over Local Areas from GOES Visual Imagery](#)

May 28, 1981 60 pages

Authors: [Thomas J. Keegan](#); [Michael Niedzielski](#); [AIR FORCE GEOPHYSICS LAB HANSCOM AFB MA](#)

**Full Text**

... , as well as the two years separately. The seasonal data were further divided into those cases that contained predominantly ice crystal **clouds** or water **clouds**. The characteristics of the satellite data were computed for a 9 by 9 one-mile pixel box and were the average, maximum and minimum albedos, ... attention was given to the relationship between average albedo and cloud amounts. Equations were generated for each station for each year for the water droplet **clouds** during the spring/summer season. There were not sufficient cases to do the same for the autumn of the ice crystal cloud cases. There ...

[Fuel-Air Explosive Simulation of Far-Field Nuclear Airblasts](#)

Dec 31, 1979 244 pages

Authors: [T. H. Pierce](#); [R. T. Sedgwick](#); [S-CUBED LA JOLLA CA](#)

**Full Text**

... at the one kiloton level. Two issues have been researched in parallel efforts. These are the mechanisms by which largescale FAE **clouds** of controlled shape can be reliably and repeatedly formed and detonated, and the quality of nuclear airblast simulation that is achieved when such FAE **clouds** are detonated. The formation of hemispherical **clouds** by simultaneous, impulsive liquid fuel injection through a large number of radially directed, centrally clustered nozzles is discussed in detail. Specific fuel dispenser designs are ...

[The Whole Sky Sensor](#)

Feb 26, 1986 64 pages

Authors: [James K. Rocks](#); [MICRO SCIENCE INC LEESBURG VA](#)

**Full Text**

The height and velocity of visible **clouds** and percent cover at several altitudes over a portion (28 degree cone) of the sky can be determined ... . A simple algorithm for the corresponding of points in 3-space has been found. There is some indication that types of **clouds** can be identified from an examination of the population statistics of the images. The system should include shelters for the instruments and an auto-iris attachment. More experience with different kinds of **clouds** and extensive field testing are required. Algorithms for slant range viewing, non- horizontal cloud forms and time ...

[Comparison of Areal Extent of Snow as Determined by AVHRR and SSM/I satellite Imagery](#)

Sep 1992 106 pages

Authors: [Robert W. Maxson](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

**Full Text**

... 4 (11.Oum), creates a synthetic image that classified land, snow, water and **clouds**. The classified images created by this algorithm serve as a baseline for a second algorithm that examines ... data provides high resolution, daytime images of the snow pack but is completely dependent on the absence of **clouds** to view this ground based feature. The SSM/I data gives lower resolution imagery of the snow during daylight or night time satellite passes and is not affected by the presence of nonprecipitating **clouds**. A total of 12 sub scenes are analyzed using both data sets and general agreement of the ...

[Annual Technical Report for Contract N00014-91-J-4017 \(South Dakota School of Mines and Technology\)](#)

Sep 30, 1992 8 pages

Authors: [SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY RAPID CITY INST OF ATMOSPHERIC SCIENCES](#)

**Full Text**

The primary objectives of the research are to numerically simulate stratus, stratocumulus, and cumulus **clouds** in the marine boundary layer. This will include the formation, evolution, and dissolution of the **clouds** and the area covered by the cloud fields. If a large enough domain can be covered, then the change from ... in space and time? What causes the changing depth of the boundary layer? What are its interaction with the **clouds** in and out of the boundary layer? A third objective is to compare various numerical models among themselves ...

[Modeling of Cloud/Radiation Processes for Tropical Anvils](#)

Nov 30, 1992 108 pages

Authors: [Q. Fu](#); [K. N. Liou](#); [S. K. Krueger](#); [UTAH UNIV SALT LAKE CITY CENTER FOR ATMOSPHERIC AND REMOTE SOUNDING STUDIES](#)

**Full Text**

Satellite imagery suggests that large portions of the tropics are covered by extensive cirrus cloud systems. Tropical cirrus **clouds** evolve during the life cycle of the mesoscale convective systems and are modulated by large- scale disturbances. Outflow cirrus **clouds** from tropical cumulonimbi appear to be maintained in a convectively active state by radiative flux gradients within the **clouds**, as suggested by Danielson (1982). Extensive anvils are likely to become radiatively destabilized by cooling at tops and warming at bases ...

- [Executive Summary of the Cloud Impacts on DoD Operational and Systems 1991 Conference \(CIDOS-91\) Held in El Segundo, California on 9-12 July 1991](#) Dec 18, 1992 47 pages  
 Authors: [D. D. Grantham](#); [J. W. Snow](#); [PHILLIPS LAB HANSCOM AFB MA](#)  
 ... research for cloud effects on weapon, communications and surveillance systems. The theme of CIDOS-91 was 'Clouds - The First Order Impact for Defense and Climate Change'. Two Keynote addresses were presented: ... topics: Better Customer Interface; New Model/Database Requirements; and, the development of a new DoD Clouds Handbook. The recommendations from the working groups and the CIDOS Executive Committee will be submitted to OUSDR and E and will form new statements of need to the tri-service agencies.... Clouds, Cloud models, Cloud simulation, Cloud data bases, Cloud observing, Cloud sensors, ...
- [Full Text](#)
- [The Influence of Forest Fire Induced Albedo Differences on the Generation of Mesoscale Circulations](#) May 1993 97 pages  
 Authors: [John B. Knowles](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH](#)  
 ... by the Regional Atmospheric Modeling System (RAMS) in order to show the circulation's ability to generate clouds and precipitation. The simulations used two fires that occurred during the summer of 1988. The ... developed mesoscale circulation with a vertical updraft speed of over 3.5 m s<sup>-1</sup>. The simulation also developed clouds and precipitation directly above the circulation center. Simulation of the second fire burn area generated ... a vertical updraft speed of over 2.5 m s<sup>-1</sup>. Although the second simulation did develop clouds and some very light precipitation, it could not be directly tied to the ...
- [Full Text](#)
- [DMSP Special Sensor Microwave/Imager Calibration/Validation. Volume 1](#) 1990 187 pages  
 Authors: [NAVAL RESEARCH LAB WASHINGTON DC](#)  
 ... brightest parts of the globe are low altitude land. Mountains, lakes, and rivers, such as the Amazon, are darker, cooler features on the continents. Clouds vary greatly in brightness, depending on the amount of water present. Rain and hail in thunderclouds are warmer than the surrounding clouds so that regions of precipitation are relatively light. Although the intertropical convergence zone is visible over the ocean, the view of land is relatively unobstructed where the clouds cross the continents.
- [Full Text](#)
- [Debris Cloud Material Characterization for Hypervelocity Impacts of Single- and Multi-Material Projectiles on Thin Target Plates](#) May 1994 158 pages  
 Authors: [William P. Schonberg](#); [ALABAMA UNIV IN HUNTSVILLE DEPT OF CIVIL AND ENVIRONMENTAL ENGINEERING](#)  
 ... of time, under less intense loads, and over a much larger area of the target. In KEW impacts, one or more debris clouds are created during the initial impact on the outer wall of a target. These debris clouds can contain solid, melted, and vaporized projectile and target materials. The levels of melt and vaporization within the debris clouds determine the loads transmitted to various internal target components. To accurately determine total target damage, a lethality assessment scheme must include the ...
- [Full Text](#)
- [Prediction of Global Cloud Cover with a Very High Resolution Global Spectral Model](#) May 3, 1994 115 pages  
 Authors: [T. N. Krishnamurti](#); [FLORIDA STATE UNIV TALLAHASSEE DEPT OF METEOROLOGY](#)  
 The completed research is in the area of cloud prediction with a high resolution global model. We have extended our studies on the handling of implicit clouds (i.e. clouds specified as a function of prevailing humidity). We have also examined this problem in the context of rainfall initialization (called physical initialization). We demonstrate a strong positive ... the explicit over the implicit scheme. That work was performed using a low resolution global model. Further work on the improvement of the explicit scheme at higher resolution is required. Cloud prediction, Global modelling of clouds.
- [Full Text](#)
- [Study of Midlatitude and Arctic Aerosol-Cloud-Radiation Feedbacks Based on LES Model with Explicit Ice and Liquid Phase Microphysics](#) Oct 4, 1996 8 pages  
 Authors: [Yefim L. Kogan](#); [OKLAHOMA UNIV NORMAN](#)  
 ... at investigating the cloud radiation feedbacks in midlatitude, subtropical, and high latitude low level clouds. We will continue the study of marine stratocumulus clouds using LES simulations based on FIRE I and FIRE I i/ASTEX observational data. The data will be used to validate the CIMMS LES ... explicit formulation of aerosol and cloud drop size resolving microphysics and radiation. The study of mixed phase clouds will use the new version of the CIMMS model which includes also explicit formulation of the ice phase microphysics. ...
- [Full Text](#)
- [Cloud Condensation Nuclei Measurements in Shiptrails](#) Nov 1997 2 pages  
 Authors: [James G. Hudson](#); [MACKAY SCHOOL OF MINES RENO NV](#)  
 Enhancements of droplet concentrations in clouds affected by four ships were fairly accurately predicted from ship emission factors and plume and background cloud condensation ... the increased droplet concentrations in these ship tracks. Derived supersaturations were typical of marine stratus clouds, although there was evidence of some lowering of supersaturations in some ship tracks closer to the ships ... , diesel ships burning low grade fuel were responsible for nearly all of the observed ship track clouds. There is some evidence that fuel type is a better predictor of ship track potential than ...
- [Full Text](#)
- [Development and Testing of Physical Algorithms for Cloud Forecasting on the Mesoscale](#) Mar 18, 1998 23 pages  
 Authors: [William R. Cotton](#); [COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC SCIENCE](#)  
 ... on the development of a comprehensive mesoscale numerical weather prediction (NWP) system for forecasting clouds anywhere in the world. The host model for performing this research, RAMS, has been extended to ... to telescopically nest anywhere on earth and provide high resolution 24 to 48h forecasts of clouds and precipitation. Some of the physical modules developed under support of this project include: a ... microphysics model. The new cloud forecasting scheme has been tested in applications to Arctic stratus clouds,
- [Full Text](#)

and mid-latitude and tropical cirrus. The model has been shown to perform ...

#### [Worldwide Cloud Forecasts with Neural Networks](#)

May 1, 1998 113 pages

Authors: [Kenneth A. Poehls](#); [David M. Crandall](#); [Kevin O'Rourke](#); [Kenneth E. Heikes](#); [PACIFIC-SIERRA RESEARCH CORP SANTA MONICA CA](#)

**Full Text**

... regions than the current HRCF model. The approach demonstrated the ability to predict both the advection and evolution of **clouds**. Performance was best in regions of significant cloud cover, regions of scattered **clouds** were smeared. RMS prediction errors of about 20% were typical for the WCPM as compared to rms errors of about 30% for tropical HRCF predictions. An alternative, fully object oriented approach to the NN is outlined to improve the performance and forecast sharpness in regions of scattered **clouds**.

#### [Understanding Satellite Cirrus Cloud Climatologies with Calibrated LidarOptical Depths](#)

1994 40 pages

Authors: [Donald Wylie](#); [Paivi Piironen](#); [Walter Wolf](#); [Edwin Eloranta](#); [WISCONSIN UNIV-MADISON SPACE SCIENCE AND ENGINEERING CENTER](#)

**Full Text**

Optical depth measurements of transmissive cirrus **clouds** were made using coincident lidar and satellite data to improve our interpretation of recent satellite cloud climatologies. These climatologies differ in the way they detect transmissive **clouds** because some use solar reflectance data (ISCCP) while other use multi-spectral infrared data (CO2 Slicing). To relate these climatologies and estimate the impact of transmissive **clouds** on the earth's heat budget, a relationship between visible and infrared radiation properties has to be used. We examined the ...

#### [Prediction of Global Cloud Cover with an Explicit Formulation](#)

Dec 31, 1998 14 pages

Authors: [T. N. Krishnamurti](#); [FLORIDA STATE UNIV TALLAHASSEE DEPT OFMETEOROLOGY](#)

**Full Text**

... wished to improve our global cloud forecasting capability (low, medium and high **clouds**) and to have a better definition of the cloud radiative effects. A band model is being ... for the short and long wave radiative transfer. A major component of this study is the initialization of **clouds**. For this purpose we have utilized the U.S. Air Force Real-Time Nephanalysis product called RTNeph. ... water mixing ratios are vertically partitioned using weights from the RTNeph; this provides an initial definition of **clouds** and cloud fractions. These were further initialized using the procedure of physical ...

#### [Spatial-Spectral Sensor Techniques for Detection of Atmospheric Turbulence](#)

Mar 3, 2000 71 pages

Authors: [Robert D. Sears](#); [Lyle Broadfoot](#); [VANGUARD RESEARCH INC FAIRFAX VA](#)

**Full Text**

... Our concept for worldwide detection, characterization and mapping of atmospheric turbulence and cirrus **clouds** involves use of satellite-borne (and possibly airborne) spectral and hyperspectral imagers operated in ... and hyperspectral imagery allows altitude sounding of atmospheric clutter from turbulence and cirrus **clouds**. Triangulation geometry allows precise attitude selection by cross correlation of the backscatter signals ... resolved measurement of atmospheric clutter from the clear air turbulence and from cirrus **clouds**, both of which may affect performance of the SBL (Space Based Laser) ...

#### [Unified Retrieval of Cloud Properties, Atmospheric Profiles, and SurfaceParameters from Combined DMSP Imager and Sounder Data](#)

May 1, 2000 60 pages

Authors: [Ronald G. Isaacs](#); [Sid Boukabara](#); [Jennifer Hegarty](#); [Chris Lietzke](#); [Richard Lynch](#); [ATMOSPHERIC AND ENVIRONMENTAL RESEARCH INC CAMBRIDGE MA](#)

**Full Text**

... The second task explored additional attributes of the microwave measurements, particularly related to ice **clouds**, to investigate the possibility of identifying multi-layer **clouds** from simultaneous microwave, visible and infrared data, and to provide infrared emission properties needed for threshold-based cloud detection. ... properties were uncertain and to assess ability to characterize the vertical structure of multi-layer **clouds**. The third task investigated the feasibility of predicting infrared emission properties using the microwave ...

#### [Measurement and Prediction of Particulate Concentration Within External and Internal Flows](#)

Oct 1997 98 pages

Authors: [Lisle H. Russell](#); [Philip M. Bushong](#); [Robert E. Richardson](#); [NAVAL SURFACE WARFARE CENTER DAHLGREN DIV VA](#)

**Full Text**

The focus of this report is the formation, growth, and transport of airborne particulate **clouds** within the boundary layer atmosphere as well as the interaction of such **clouds** with the terrain surface and objects (e.g., ships and buildings) on the earth's surface. The methodology outlined in the report can be used to answer the simple question, 'What happens to particulate **clouds** once they are formed?' The specific particulate subjected to detailed analysis was a millimeter-wave (mmw) obscurant. A novel ...

#### [Cloud Optical Depth Retrieval from Cloud Radar and Microwave Radiometer Measurements](#)

Nov 5, 2004 27 pages

Authors: [Paul R. Desrochers](#); [AIR FORCE RESEARCH LAB HANSCOM AFB MA SPACE VEHICLES DIRECTORATE](#)

**Full Text**

Radar and microwave radiometer measurements of **clouds** were taken along the California Coast at Vandenberg AFB on 10 Sept. and 18 Oct 2003 in conjunction with Minuteman III and Titan II rocket launches. The purpose was to characterize the **clouds** to derive an estimate of the optical depth at the time of the launches. These measurements support the Signature Exploitation Program development effort at AFRL to detect rocket emissions through optically thick **clouds**. The instruments used were the Air Force Research Laboratory Ka-band (35 GHz) Doppler radar, termed the Air Force Cloud ...

#### [Low Noise Simultaneous Fluorescence Detection of Two Atomic States \(PREPRINT\)](#)

Apr 5, 2006 5 pages

Authors: [M. T. Cashen](#); [J. B. Fixler](#); [G. W. Biedermann](#); [M. A. Kasevich](#); [STANFORD UNIV CA DEPT OF PHYSICS](#)

[Full Text](#)

We have demonstrated a new technique for fluorescence detection of ultracold atoms. Fluorescence from two spatially separated **clouds** of ultracold atoms illuminated by a mutual probe laser was imaged onto opposite quadrants of a position-sensitive detector. The populations in the two separated atomic **clouds** were measured by integrating the quadrant detector photocurrents. Simultaneous detection of the populations of the two atomic **clouds** was used to reduce noise caused by fluctuations in detection laser amplitude and frequency. Using this technique we ...

[Large-Eddy Simulation of Stratocumulus-Topped Atmospheric Boundary Layers with Dynamic Subgrid-Scale Models](#)

Mar 24, 2004 12 pages

Authors: [Inanc Senocak](#); [CALIFORNIA INST OF TECH PASADENA](#)

[Full Text](#)

Earth's climate and its geographical variation is strongly influenced by cloud coverage. It is estimated that about 50% of the earth is covered by **clouds** at any given time, providing a shield from solar radiation. Radiative energy transfer and its interaction with **clouds** play an important role in the thermal structure and stratification of the atmosphere. For instance, **clouds** have high reflectivity in the visible wavelengths, thus providing relative cooling of the atmosphere. They also absorb strongly in the infrared wavelengths, resulting in heating of the atmosphere (Salby 1996).

[PRECURSOR SHOCKS PRODUCED BY A LARGE YIELD CHEMICAL EXPLOSION](#)

1965 1 pages

Authors: [John M. Dewey](#); [SUFFIELD EXPERIMENTAL STATION RALSTON \(ALBERTA\)](#)

[Full Text](#)

In July 1964, a 500 ton TNT hemispherical surface burst charge was detonated at Suffield Experimental Station. High-speed photographs of the explosion show that in some radial directions dust **clouds** moved out ahead of the main shock and had reached a height of 50 ft. before its arrival. The dust **clouds** were enveloped by a shock wave. At ground-level this precursor eventually became downward facing and produced a reflected shock and a Mach stem. Photography from an aeroplane at 19,000 ...

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