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Oceanography and Atmospheric Sci. Meteorology

Evaluation of Stochastic Models for Estimating the Persistence Probability of Cloud-Free Lines-of-Sight

Authors: [Wayne S. Hering](#); [SCRIPPS INSTITUTION OF OCEANOGRAPHY LA JOLLA CA MARINE PHYSICAL LAB](#)

Abstract: Stochastic models, based upon the Ornstein-Uhlenbeck (O-U) class of the simple Markov process have been used effectively to estimate the conditional probability of a variety of weather events (Gringorten, 1972). This study is directed toward extension of the analytical form of the O-U Markov model to yield estimates of the joint occurrence probability and duration of sky cover and cloud free lines of sight (CFLOS). As a first step, model estimates are made of the recurrence probability of CFLOS for specific categories of sky cover in tenths as a function of time. Then model calculations are made for the **persistence** probability of CFLOS and sky cover as a function of sky-cover category and time using an analytical representation of the mathematic solution of **persistence** probability for the O-U Markov process given by Kielson and Ross (1975). The model calculations of CLFOS recurrence and **persistence** are compared with the Columbia, MO, data base (Lund, 1973). Again using an analytical form of the O-U Markov model, calculations are made of the joint occurrence probability of sky-cover at two or more sites and compared with the observations from the central United States. Finally, analytic techniques are presented for calculating probability estimates of the duration of cloud-free or cloudy lines of sight from one or multiple ground sites to points in space. Trial calculations based upon climatic summaries of sky-cover are made for a selected group of sites in south western United States. Keywords: Cloud-free-line-of- sight, Whole-sky imagery, Stochastic modeling, Markov process, Recurrence and **persistence** probability, Sky cover, Weather, CFLOS, Probability, Climate. (JG)

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Description: Scientific rept. no. 1, 1 Oct 88-30 Sep 89

Pages: 21

Report Date: 30 SEP 89

Contract Number: F19628-88-K-0005

Report Number: A382022

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