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NASA-CR-174047

E85-10024

Final Technical Report

NASA Cooperative Agreement NCC 5-20
Department of Geography
Columbia University

(E85-10024 NASA-CR-174047) APPLICATION OF N85-11437
DIGITAL ANALYSIS OF MSS TO
AGRO-ENVIRONMENTAL STUDIES Final Technical
Report (Columbia Univ.) 4 p HC A02/MF A01
CSCI 05B G3/43 00024
Unclas

Title: Application of Digital Analysis of
MSS to Agro-Environmental Studies

Period: 1/1/80 - 9/30/83

Principal Investigators: S.N. Goward
R.A. Lewis

The Department of Geography at Columbia University has conducted NASA-funded research in cooperation with scientists at the Goddard Institute for Space Studies since 1975. As of January 1980 this activity was carried out under NASA Cooperative Agreement NCC 5-20. Studies have focussed on remotely sensed observations of vegetation, in particular, agricultural crops. Significant progress was achieved in processing and analysis of spectrometer data, aircraft multispectral scanner observations and Landsat MSS measurements. The studies also considerably assisted achievement of educational goals for eight students directly involved in the research and several others who benefited from exposure to the concepts, problems and methods developed during the research. Three students received Master of Arts degrees, two students received PhD's and three students are within one year of completing PhD degrees as a result of the research and support provided under NCC 5-20.

Research activities focussed on problems related to the NASA AgRISTARS program, Fundamental Research problems particularly related to the Thematic Mapper sensor, and cooperative research activities carried out between NASA-GISS and the Army Corps of Engineers Cold Regions Research and Engineering Laboratory. Highlights of the research include:

- 1) Demonstration and explanation of the value of middle infrared (1.4-2.5 μm) for analysis of vegetation canopies; specifically for discrimination between corn and soybeans;
- 2) Preliminary investigation of the role remotely sensed observations may play in global assessments of vegetation activity;

- 3) Successful conduct of urban-rural albedo study from Landsat observations and ground calibration measurements;
- 4) Assessment of the role of thermal infrared measurements in vegetation analysis;
- 5) Thorough analyses of Field Spectrometer System (FSS) observations for LACIE and AgRISTARS test sites in the Great Plains and Cornbelt, including assistance in isolating wavelength calibration problems of the filter wheel;
- 6) Systematic development of aircraft geometric and radiometric processing techniques which are now employed at the Johnson Space Flight Center, Jet Propulsion Laboratory, Ames Research Center and Goddard Space Flight Center for past flight processing of aircraft MSS data;
- 7) Successful use of Landsat MSS observations to map wetlands and snow cover in several regions of the United States in support of U.S. Army Corp of Engineers (CRREL) objectives.

Much of the research progress achieved during this 4 year period was accomplished because of the free exchange of ideas which took place between the University personnel and the NASA scientists. This highly stimulating atmosphere was in part the result of the administrative structure of the Cooperative Agreement. Under this instrument parties on each side of the research did not feel constrained about expressing their opinions and contributing to real progress. For institutions in close proximity to each other this

approach to research is highly recommended. Of course the success of this particular cooperative agreement in great part occurred because of the specific environments provided at the NASA Goddard Institute for Space Studies and the Department of Geography, Columbia University. Every effort was made at each institution to assist the research effort. The contributions of Dr. Robert Jastrow, Dr. James Hansen, and many others at NASA/GISS and Dr. Robert Lewis, Dr. Kempton Webb, Mary McLeod and Mary Yastishak of Columbia University have been most appreciated. Special recognition is accorded Dr. Stephan G. Ungar, research director of earth resources at NASA/GISS. Without his ceaseless energy and attention to detail none of this activity would have been possible.