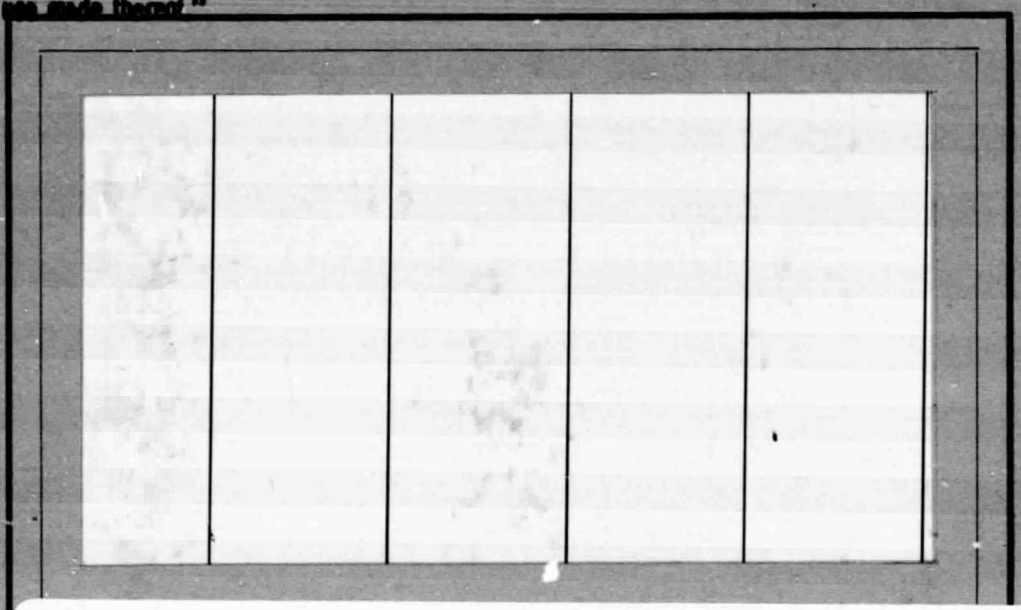

ISTITUTO DI AERODINAMICA

UNIVERSITA' DEGLI STUDI - NAPOLI

INVESTIGATION TITLE: Land Slides Investigation in Southern Italy (ARDUO PROJECT)

PROPOSAL No.28430

P.I.NAME: Prof. Luigi G. NAPOLITANO

PROJECT COORDINATOR : Prof. Sergio VETRELLA

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I - INTRODUCTION

The ARDUO Project is an interdisciplinary program for the study of land-slides and their connection with ground and underground water, vegetative cover and slope gradient.

The program is based on the collaboration of the following Italian Institutes:

- The Institute of Aerodynamics of the Faculty of Engineering of the University of Naples.
- The Institute of Geology of the Faculty of Science of the University of Naples.
- The Institute for the Hydrogeological protection of Southern Italy of the National Research Council (I.R.P.I.)
- The Geomining Institute of the National Committe for Nuclear Energy (C.N.E.N.).

Each Institute gives a contribution of men and means, and financings obtanined by the National Research Council, by the National Committee for Nuclear Energy, by the Ministry od Education and by the European Economic Community.

The Institute of Aerodynamics provides for the distribution of the imagery of the Landsat-B and for the carrying out of recurrent meetings to discuss the results and to program the various activities.

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The responsability of the acquisition of the data through telesensors from aerial platforms (airplanes and captive balloons) is of the Institute of Aerodynamics, and also the analysis of the data through false-colour and automatic techiques.

Some bureaucratic mistakes have delayed the arrival of the financings obtained by the National Research Council, causing a delay also in the realisation of the Arduo Project.

The financing of about 300.000 dollars has been divided into two parts, the former of which arrived about 10 months ago.

According to the acquisition of the data it has been realized a multi-spectral System with four HASSELBLAD 500 EL/M cameras with 40 and 80mm. lens and 70mm. films magazines.

The support is furnished with micrometric screws for the registration of the axis of the cameras.

The four cameras are controlled by an intervallometer built by the Institute of Aerodynamics, which records the total number of photograms for each camera and signalizes the eventual stop of one or more cameras. Apart from the multispectral photographic system, we have bought an Exotech 100 multicanal radiometer acting in the same bands of the Landsat. The platforms from where these telesensors are used are a sigle engine 180Hp Fachiro P-57 Partenavia airplane at maximum altitude level of 15.000 feet and two 14m^3 captive balloons which can reach a 2000 feet altitude.

On the air plane, the radiometer is used with a Honeynell recorder and a telecamera put on the same optical axis; on the captive balloon there are one or two HASSELBLAD as those already described or a radiometer, togheder with an automatic Olympus camera, and each thing is controlled from the ground.

For the photo-interpretation it is used a multi-spectral Sigurd Sörum system, a Zeiss and a wild stereoscope, luminous tables etc.

For the analysis of the digital tapes a 64K CDC 17 computer is used, with two disks, two tape units, a digigraphic, a Calcomp plotter, a card reader and a priting unit connected with a 370 IBM, both property of the Institute of Aerodynamics. With the remaining part of the financing, arrived in these days, we will buy an Image Analy-

zer that can precision-expand the images up to 50: 1, and up to 100: 1 at lesser precision; an interactive colour viewer and an image digitalizer Whic will be connected to the CDC 17 Computer.

The work done up to now has focalized over four Italian regions and precisely over Campania, Calabria, Puglia and Lazio. Over such zones data regarding the land-slidea of the last ten years have been gathered and these eventd have been classified according to a standard established by Prof. Antonio Vallario of the Institute of Geology of the University of Naples.

Campaigns of relief have been done"in situ"by the Institute of Geology of Naples in Campania and by the IRPI in Calabria.
The Institute of Geology was represented by Prof. d'Argenio, Prof. Pescatore, Prof. Guzzetta, and other professors, together with twenty students; the IRPI was represented by Dr. Carrara, Dr. Merenda, other researcher and technicians of the Institute and group of students.

Over the areas of these two Italian region, several aerial missions have been carried out during last month, with multispectral shots of the same bands of the Landsat.

Gathered data are completed with 1:15.000, 1: 25.000, 1: 100.000maps and with aerial 1:33.000 photos of the Military Geographic Institute.

Land slides and other useful informations (vegetation, trying to establish their birth-date and their evolution, and reported on various scale maps. After this preparatory work we compare the obtained informations to the enlargement of the photos of Landsat, not less than 1: 250.000.

The results obtained up to now, in this comparison, are not satisfactory because only in very cases it has been possible to locate land slides, obtained by photos from a 12.000 to a 33.000 scale on the pictures of Landsat.

It may that land slides considered up to now have limited size, i.e. of about three hundred feet, and also that the delay of the financings has not permitted to the researchers of deepening what they got and of considering largest land slides.

Contemporary with the work of photointerpretation, waiting for the arrival of the instruments, software for the analysis of the digital tapes of Landsat have been adapted

and developed.
A part of the programs have been formed and adopted by Larsys, others, on the contrary, exploiting the plotter and the digigraphic have directly developed by the researcher of the Institute of Aerodynamics.
The work already done does not give yet the possibility of proving any information on the usefulness of the magnetic tapes for the study of land slides.

The researchers think it is necessary a worling period of about 6 months to be able give more detailed informations.

III ACCOMPLISHMENTS

As we have already said in the previous paragraph, the data of the Landsat-B have not given yet any significant results in the field of land slides.

the analysis of the photos of Landsat has anyway the possibility of studying the structural characteristics of zones as the Gargano and the Matese and of revising some cartographical informations on 1: 100.000 maps.

IV PROBLEMS

The graetest problem we met in the development of Arduo Project was the delay of the arrival of the funds granted by the National Research Council. This has compelled the researchers to delay the realisation of the program.

Another problem depends the fact that for each zone examined we couldn't obtain more than two photos from Landsat.

This dit not allow the observation of the variation of phenomena in the time and in particular of localize and control land slides throug a subsequential comparison of the pictures of Landsat. Besides, as we already said, most observed land slide can not be localized at a 1: 250.000 scale on account of their small size, a 1:250.000 scale is the one generally used.