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SATELLITE IMAGES RECEPTION ACTIVITY WITHIN THE POEM PROJECT

R. CARLÀ, V.M. SACCO, S. BARONTI and V. VENTURI

Istituto di Ricerca sulle Onde Elettromagnetiche (IROE), CNR, Firenze (Italia)

Data and images from satellites play a particular role when used with information of experimental campaignes simultaneously performed,allowing comparisons between ground and satellite sensed information. Moreover meteorological satellites, with their resolution characteristics are very useful for monitoring the whole campaign area, and to collect data on environmental parameters (for example cloud coverage and classification, ground and sea temperature, etc.). The acquisition period of these satellites is suitable to give useful information for a continuative daily campaign.
The IROE-CNR Institute in Florence has designed and developed a mobile receiving station for images from both geostationary and polar orbiting satellites. The station is a container supported equipment for receiving, acquiring, recording and processing a wide variety of signals, either in analogical or digital format, and it is equipped with suitable instrumentation for data presentation both on video display or digital plotter. Moreover the station is completely controlled by an HP-2113/E which also performs the data processing.
The satellite image receiving and processing group has received and digitally stored on magnetic tapes the APT-NOAA 9 polar orbiting satellite images, supporting the POEM oceanographic campaign from October 21 to November 11, 1985 in the Southern Adriatic sea.
Images have been recorded during the ascending passes of the satellite between 12.00 and 14.00 (UT) once a day, both in the Visible and in the corresponding Thermal Infrared bands.
The analogical APT (Automatic Picture Transmission) format gives 4.0 Km resolution images compared with the 1.1 Km resolution ones of the digital format. Neverthless the APT format is a good compromise between information, receiving cost and complexity for a wide range of applications.
Unfortunately the analogical signal is affected by high frequency man-made environmental noise.
To characterize, eliminate or reduce the noise a study has been performed, and many suitable linear and non-linear digital techniques have been considered. Moreover a non-linear filter of statistical type has been developed which eliminates the noise effects without modifying data significative information, particularly in presence of strong gray level variations, such as coast areas or clouds.

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FRACTAL TRAJECTORIES OF SATELLITE TRACKED DRIFTERS IN THE PACIFIC OCEAN

A.R. OSBORNE[1], A.D. KIRWAN[2], A. PROVENZALE[3] and L. BERGAMASCO[3]

(1) Istituto di Cosmo-Geofisica del CNR, Corso Fiume 4, Torino (Italia)
(2) Department of Marine Sciences, University of South Florida, St. Petersburg, Florida (U.S.A.)
(3) Istituto di Fisica Generale dell'Università, Corso M. d'Azeglio 46, Torino (Italia)

Drifter data from the world oceans furnishes a Lagrangian description of oceanic surface flows; time series of fluid parcel trajectories can be obtained by satellite tracking the longitude and latitude positions of a set of buoys drogued to a parachute at a preselected depth.[1]

We consider here Lagrangian trajectories of three satellite tracked drifters deployed in the Kuroshio current south of Japan, a region known for its intense mesoscale variability. Evidently the buoy motions are determined largely by the local turbulent (Eulerian) velocity field and the trajectories appear as wandering curves which resemble a "stochastic walk" in the plane.

Applying several methods from fractal mathematics and dynamical systems theory (calculation of the correlation dimension,[2] of the self similarity exponent and of the law of divergence of the length of the trajectories[3]) we have found that the buoys trajectories are self-similar fractal curves with Hausdorff dimension D=1.2.[4,5] The observed value of the fractal dimension is related to the characteristics of the power spectra of the buoys positions, which are power law over a large energy range. Systems of this type are likely to be appropriately described by processes of (fractal) stochastic diffusion in a many-degree-of-freedom turbulent flow.

Similar analyses can be applied to other drifter data from different areas of the world. An interesting and open problem is to asses if the fractal dimension found for the Lagrangian trajectories in the Kuroshio extension (D=1.2) is common to other ocean turbulent flows and thus typical of fluid particle paths in geophysical fluid dynamical turbulence.

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