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Annual Report to:
Frank Herr, ONR Code 1121RS

From: Bill Emery, CCAR Box 431, U. Colorado, Boulder, Co., 80309

Title: Ocean surface currents computed from sequential infrared satellite images

Long Term Goals

1. To evaluate the accuracy and reliability with which surface currents can be computed from sequential infrared and color satellite images.

2. To develop techniques to better resolve surface currents computed objectively from sequential satellite images.

Short Term Objectives

1. To resolve rotational and frontal displacement motion along with the primary along-front advection depicted in sequential satellite images. This applies only to regions of strong currents with marked SST signatures (i.e. the Gulf Stream).

2. Estimate using direct observations and model simulations the contributions of surface heat fluxes to changes in satellite SST patterns used to compute surface motion.

Present Accomplishments

1. Rotational motion represented by mesoscale ocean eddies has been resolved using both eddy specific techniques and by changing the processing parameter (window size) of the MCC technique. Both methods have been shown to map well the rotational motion in a Gulf Stream ring.

2. Applying next neighbor filtering to the resultant current field has successfully brought out the desired motion field while supressing the incorrect motion vectors. These techniques have been applied to series of

images in the Gulf Stream region to map surface currents.

3. This application made it clear that the Gulf Stream must be handled separately from the rest of the images due to both its stronger velocities and its weaker surface temperature gradients. Thus we have developed a separate treatment of the central Gulf Stream that relies primarily on the feature displacements along the edge of the current to map the along stream velocities.

4. Due to a lack of in situ obeservations useful for validation we have used a quasi-geostrophic model (from Holland) to verify the MCC computations in the Gulf Stream region. A random surface tracer was introduced into the model calculations and the MCC method was applied to view the displacements. These displacements were then compared with the surface velocities of the model. This comparison showed the MCC method to perform well for images separated by less than 12 hours in time.

3. We have received one of the very few sets of data capable of estimating the contribution of the surface heat flux to changes in satellite SST patterns. These data are from the FASINEX experiment and the cooperation of Bob Weller, Carl Friehe and Peter Cornillon has been very helpful in putting together this set of data.

The analysis of these data has proven to be very inconclusive in that the changes in the satellite infrared images cannot be related to the changes seen at the FASINEX moorings. We have even corrected the satellite images for the skin temperature effects and used a 1-layer Price model to extend the satellite infrared measurements into the upper ocean. As a result of the failure to relate the satellite data to the FASINEX temperature changes we have decided to perform the same analysis on a numerical model capable of exhibiting both horizontal advection and vertical heat exchange. We hope in this way to be able to understand the problems in coupling the FASINEX in situ and satellite data.

Papers published or submitted:

Emery, W.J. and C. Fowler, 1989: Resolving Gulf Stream flow details in

sequential infrared satellite images. to be submitted to J. Atm. Ocn Tech by the beginning of March, 91.

Number of undergraduate students supported (at least part time) - 0

Number of graduate students supported (at least part time) - 1

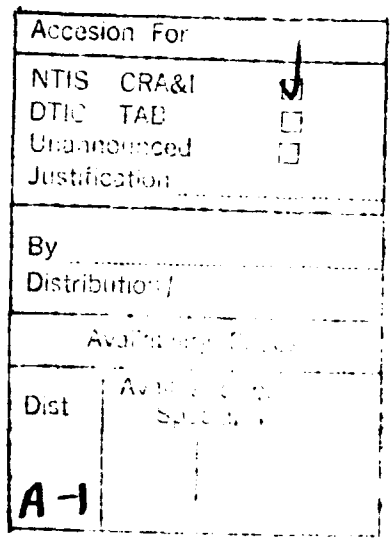
Number of post-docs supported (at least part time) - 0

Number of other professional personnel supported (at least part time) - 0

Awards, Honors and Prizes (please list)

Names of Graduate Students (GS) and Post-Docs (PD)

Charles Fowler



Statement A per telecon
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