

## MODELLING THE MIXED LAYER IN THE LIGURIAN SEA

R. BENZI and R. PIRINTI

Istituto di Fisica dell'Atmosfera - CNR  
P.le Luigi Sturzo, 31 - Rome

During the last ten years considerable research has been done in order to describe the physical mechanisms of vertical mixing in the upper layers of the ocean (see references). In the framework of one-dimensional models, field and laboratory observations have only been partially and most often poorly, explained. Many important questions have still to be answered to get a full knowledge of the phenomena of mixed layer deepening and thermocline erosion. In particular energy dissipation and small scale fluctuations at the bottom of the mixed layer (K-H instabilities) seem to be the physical clue of these questions. A recent paper by Kitaigoroskij (1978) estimates the energy dissipation in the case of a wind stirred mixed layer and the heat transfer from the air to the ocean. But when convective instabilities are more important than shear instabilities, the Kitaigoroskij analysis cannot be extended trivially and we need much more experimental information.

The statistical structure of plumes and thermals in the mixed layer is also important to compute the energy loss due to internal waves and to prescribe realistic boundary conditions at the bottom of the mixed layer. To this regard, we are going to attack the problem following the new variational approach to turbulent heat transfer proposed recently by Busse, Howard et al. (see Joseph 1976).

Another important question, related to mixed layer deepening, is the influence of large scale motion to vertical thermal structure of the sea. (For a review of the problem see Pollard 1975).

To answer such kind of questions in modelling the upper layer of the ocean, it is clear that we need as much experimental information as possible. In this context satellite observations will be useful to evaluate horizontal homogeneity. On the other hand, data on the small scale mixing fine structure are essential to test theoretical parameterization of turbulence.

At the moment we have concentrated our efforts in studying such kinds of problems for the Ligurian Sea. Experimental data are given from observations at the Bouée-Laboratoire and from the last oceanographic survey organized by the CNR (18-30 Sept. 1978). In this way we hoped not only to reach some conclusions about the main points briefly described here but also to get a more realistic description of the thermal behaviour of the Ligurian Sea.

#### References

- Kitaigoroskii, S.A., 1978. Mémoires Société Royale des Sciences de Liège, J. Nihoul (ed.), to be published.
- Joseph, D.D., 1976. Stability of Fluid Motions I,II, Springer-Verlag, Berlin Heidelberg, New York.
- Pollard, R.T., 1975. Observations and Models of the Structure of the Upper Ocean, in Modelling and Prediction of the Upper Layers of the Ocean, ed. F.R. Kraus (1977), Pergamon Press.