hyperspectral analysis. Different optical parameters (planar and scalar irradiances) will be estimated from the uprising and downrising spectral profiles. The averaged values will be used to estimate apparent (AOP) and inherent (IOP) optical properties [7][8].

The last analysis block will combine the data obtained with the sonde with external data obtained from different instruments and methods. Calibration methods will be developed for using the hyperspectral measurements as a reference for remote sensing (multispectral and hyperspectral) observations. Utilities for analyzing time and space series will also be included, specially for relating the biological experimental data (obtained at much coarser resolution) with the measurements obtained with the new instrumentation.

3. Acknowledgements
The project VARITEC-SAMPLER (CTM2004-04442-C02-2/MAR) is funded from the Spanish Ministry of Education and Science. We thank Maribel Perez and Nuria Pujol for their collaboration on the design of the hyperspectral sensor control.

4. References
[1] PME. Precision Measurement Engineering().

Turbulent oceanic flow characterization derived from high-resolution CTD data processing.
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1. Introduction
The characterization of the turbulent oceanic flow dynamics has many important implications in environmental studies (to name a few: dispersion of contaminants, harmful algal blooms or climate change).

The analysis of microstructure density profiles, obtained from high-resolution measurements of conductivity, temperature and depth (CTD), is a common approach for characterizing environmental turbulent fluid dynamics. In particular, Thorpe [1] proposed a simple method for analyzing the effects of the turbulent flows on the microstructure density profiles, which allows to compute the Thorpe displacement dT(z). Thorpe displacement is the vertical distance that an individual fluid particle (i.e. a single density value) of the original profile s(z) has to be moved in order to generate the stable density profile sm(z) (figure 1).

Many applications are derived from Thorpe displacement analysis like, for example, the detection of turbulent regions or the scale analysis of turbulent flows [2].

2. Noise reduction method
The characterization of the turbulent flow based on Thorpe displacements has been usually focused in high-stratified layers of the water column, mainly because is in these regions where there are most of the critical turbulent fluxes but also because in these case it is possible to avoid the problems related with instrumental noise [2]. Due to the instrumental noise of CTD measurements, the previous
methods reported in the literature, are usually unable to provide robust estimations of the Thorpe displacements at low-density gradient. In order to achieve the highest resolution in DT estimation is necessary to find a method for optimal signal recovering. This method should minimise the noise from the density profile, without loosing the small density perturbations derived from the overturn motions at low density gradients, which are the basis for estimating the Thorpe displacements.

When data are intermittent in nature, as is the case of density fluctuations, wavelet transforms for removing noise from data, is highly advantageous over either Fourier or real-space analysis [3].

The proposed method for noise reduction is derived from a wavelet-based thresholding algorithm [4]. This method can be decomposed in three steps (figure 2):

A. Multilevel decomposition. Fast wavelet transform [5] can be applied for decomposing a signal in two different parts, one that keeps the global features (the approximation coefficients) and the other with the local features (detail coefficients). Applying recursively such decomposition to the measured data [6], is possible to obtain empirical wavelet coefficients associated to different levels of local characterisation.

B. Thresholding. In order to reduce the noise contribution, a threshold is applied to the detail coefficients, thereby suppressing those coefficients smaller than certain amplitude.

C. Multilevel reconstruction. Denoised profile can be recovered from the transformed coefficients, applying recursively the Inverse Wavelet Transform (IWT) over each level of decomposition.

3. Future Work
Characterize and model the instrumental noise:
The proposed method in Piera (2002) [7] uses the wavelet denoising techniques to reduce the noise level. To improve these processes we need to estimate the noise features of the original data.
The noise model will be used to analyze the different options to reduce better the noise level present in the density data.

Minimize the salinity-spiking effects: The different response time of the temperature and conductive sensors produce the salinity-spiking error. This error generates false density fluctuations, producing Thorpe displacements artefacts. To reduce the effects we must detect and process the affected samples.

Develop the method to analyze CTD data: Microstructure profiles are obtained with specialized instruments known as microstructure sondes. The reduced number of microstructure data is an important obstacle to generalize the result obtained to different oceanic environments. For these reason, one of the objectives is to adapt the developed method to a more extended oceanographic instrumentation: the CTD profilers. The method extension to apply it to the CTD data, require modifications like: increase the work scale, reconsider the turbulent models used to obtain the method results. The adjustment of the method will be an important improvement to be able to use the software, of detection and identification of turbulent zones, with field measurements.

4. Acknowledgements
The project VARITEC-SAMPLER (CTM2004-04442-C02-2/MAR) is funded from the Spanish Ministry of Education and Science.

5. References