**Determination of gas transfer coefficients in different environments of the Mediterranean Sea using the radon deficit method**

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Increasing levels of atmospheric carbon dioxide from the burning of fossil fuels and changes in land uses may result in significant climate changes in the next century. Comprehension of the mechanism governing the uptake of $CO_2$ in the ocean is crucial to assess the impact on climate of atmospheric $CO_2$ concentration changes. With regard to the evaluation of $CO_2$ transfer at the air-sea interface, some uncertainties over all still exist in the dependence of the gas transfer coefficients on meteoclimatic parameters.

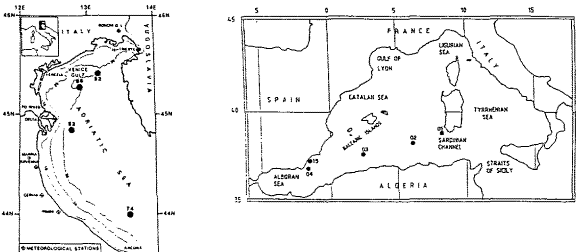


Fig. 1. Study areas and sampling points.

The disequilibrium between radon and its parent radium in the wind-mixed layer provide a widely used method for the direct calculation of the gas transfer coefficients (BROECKER and PENG, 1974). At present, a relevant number of estimations of gas exchange rates are available for the world oceans, but very few measurements have been carried out in the Mediterranean Sea.

This paper discusses the use of the radon deficit method for the calculation of gas transfer coefficients in two different Mediterranean environments: the shallow Northern Adriatic Sea and the deep Western Mediterranean between Southern Sardinia and the Gulf of Vera (Murcia, Spain) (Fig.1).

The radon deficit was estimated through the analysis of vertical profiles of radon and radium in and below the mixed layer. Five to eight samples were collected at every station. $^{222}Rn$ was stripped from seawater by helium carrier and adsorbed on an activated coconut charcoal cold trap. Radon was then eluted with toluene and measured directly onboard by liquid scintillation (QUEIRAZZA *et al.*, 1991). Radium analyses were performed on land on the same samples, after radon ingrowth, by the same method. The meteorological parameters were measured either onboard or by the Italian Air Force Meteorological Network in coastal stations close to the sampling points.

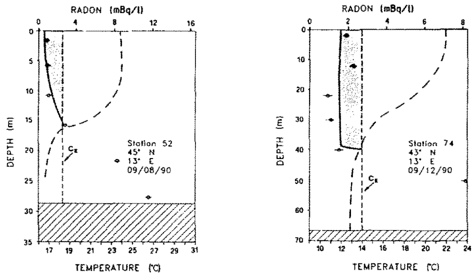


Fig.2 - Vertical profiles of $^{222}Rn$ (—) and temperature (---) at two stations in the Adriatic Sea. $C_E$=$^{226}Ra$ concentration.

In Fig. 2 the vertical profiles of $^{222}Rn$ are shown for two stations in the Adriatic Sea. For this area, the calculated gas transfer coefficients range from 4 to 7 m.d-1 for wind speeds of 2-3 m.s-1. These data are in the range of those observed for other marine environments (PENG *et al.*, 1979). However, when considering the low wind speed during the period of sampling, these gas transfer coefficients appear higher than those resulting from laboratory experiments or other field surveys. Preliminary results obtained in the other study area (SW Mediterranean) in similar meteoclimatic conditions confirm that the gas transfer coefficients calculated for the Adriatic Sea are higher than those obtained for deep-sea environments. MURPHY *et al.* (1991) have shown that large differences are noted among experimental data obtained in different environments when gas transfer velocity is correlated for wind velocity. This difference is probably related to the fact that wind speed is not the best correlating parameter for gas transfer coefficients and that wave parameters have to be taken into account in order to make an accurate prediction of gas fluxes at the air-sea interface.

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