

ESTIMATIONS OF ERRORS ORIGINATING FROM THE ASSUMPTION THAT A SINGLE MEASUREMENT REPRESENTS THE MONTHLY MEAN OF TEMPERATURE AND SALINITY IN THE NORTHEASTERN ADRIATIC

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Abstract

Errors originating from the assumption that a single measurement represents the monthly mean of temperature and salinity in surface and bottom layers have been estimated on the basis of weekly measurements in the periods 1929-1933 and 1937-1943 at station A1 off Rovinj in the northeastern Adriatic. The errors were high in April-July and in September/October and low during winter, ranging between 0.6°C-3.1°C (surface temperature), 0.7°C-2.2°C (bottom temperature), 0.2-2.5 (surface salinity) and 0.2-0.5 (bottom salinity).

Key-words: Adriatic sea, temperature, salinity.

Oceanographic data in the northeastern Adriatic have mostly been collected monthly to seasonally. The properties of the region are highly variable under the influence of air-sea interactions and dilution processes, mainly due to the Po River discharges. To study mechanisms of long-term changes of these properties, it is therefore essential to estimate the magnitude of the errors made by the assumption that a single measurement within a month represents the monthly mean of temperature or salinity.

To estimate this error we used a historical data set collected weekly in the periods 1929-1933 and 1937-1943 (Figure 1) at station A1 (45°04.0' N 13°37.0' E; 32 m depth), located in the northeastern Adriatic 1 Nm off Rovinj (western Istria, Croatia). As the temperature was measured by a reversing Richter's thermometer and salinity estimated after the Mohr and Knudsen's method (1) we expect the accuracy of measurements to be within the range of ±0.1°C and ±0.05. The mean value of a parameter (surface temperature, surface salinity, bottom temperature, bottom salinity) for *i*-th month and *n*-th year of the two intervals (P_{in}) was computed from k ($3 \leq k \leq 9$) monthly observations (P_{oin} ; $o=1 \dots k$):

$$P_{in} = \frac{1}{k} \sum_{o=1}^k P_{oin}$$

From the random choice of one between k values of P_{oin} , P_{in}' was defined and the absolute differences D_{in} were computed:

$$D_{in} = |P_{in} - P_{in}'|$$

The error in assessing monthly mean of a parameter from a single measurement for *i*-th month (E_{pi}) was taken to be the highest one among n values of D_{in} (Figure 2).

The error for temperature ranged between 0.6°C (February) and 3.1°C (June) at the surface and between 0.7°C (February) and 2.2°C (December) in the bottom layer, while for salinity it varied between 0.2 (February) and 2.5 (July) at the surface and between 0.2 (February, July, August) and 0.5 (May, June, October, December) near the bottom. Seasonal cycles of the error for both parameters were similar (Figure 3); while the errors were higher in April-July and in September/October, minimal values occurred in February. The annual variations of the error can be related to seasonal

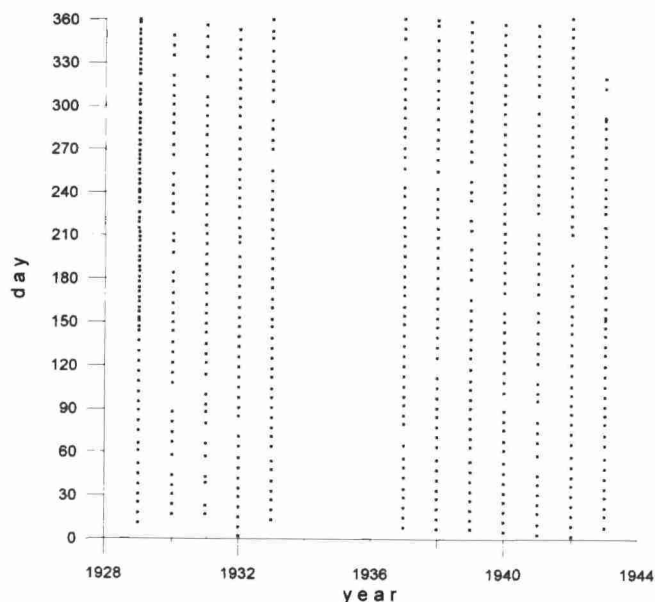


Figure 1. Frequency of measurements of temperature and salinity in the period 1929-1943 at station A1 (45°04.8' N 13°37.0' E; 32 m depth). First day of a year corresponds to January 1.

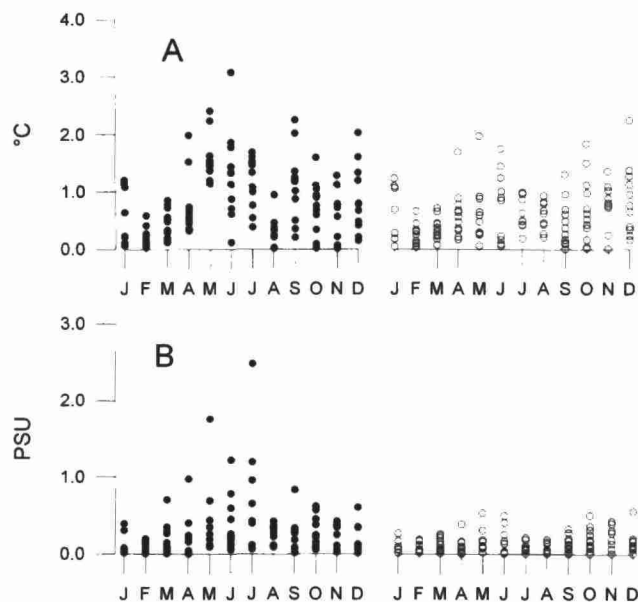


Figure 2. Absolute differences D_{in} for (A) temperature of surface (filled circles) and bottom layer (empty circles) and (B) salinity of surface (filled circles) and bottom layer (empty circles) of the station A1 (45°04.8' N 13°37.0' E; 32 m depth).

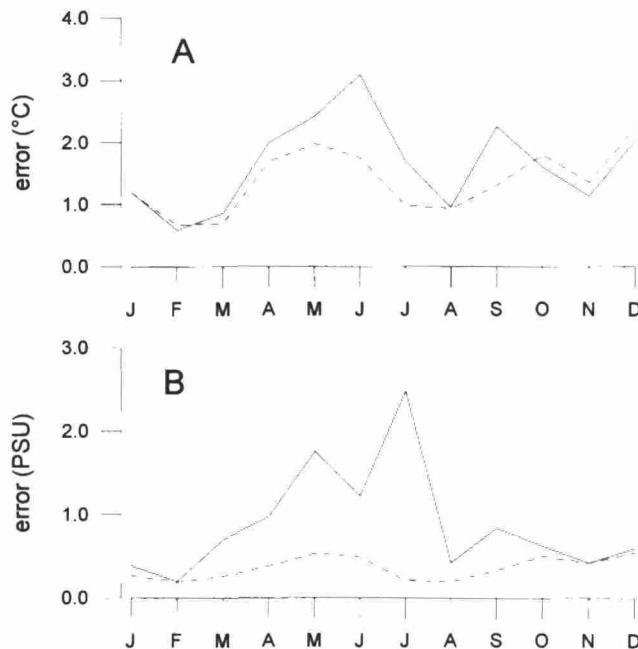


Figure 3. Seasonal variations of error estimates of monthly means for (A) temperature in the surface (solid line) and bottom layer (dashed line) and (B) salinity in the surface (solid line) and bottom layer (dashed line) in the northeastern Adriatic (45°04.8' N 13°37.0' E; 32 m depth).

cycles of temperature and salinity in the investigated area (Figure 4) obtained on the basis of monthly to seasonally sampling in the period 1966-1992 at a location close to A1 (2).