PROSOPE

**H. CLAUSTRE** : head of mission and project leader

**Phosphate (SRP)**
**MAGIC procedure :** T. MOUTIN

24 mars 2003 **Methodology** | **Data set**

# Orthophosphate analysis (modified MAGIC procedure)

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Soluble Reactive Phosphate (SRP) were analysed on board according to Murphy & Riley (1962) after a x6 concentration following the MAGnesium Induced Coprecipitation procedure (Karl *et al.* 1992). All chemicals were of reagent grade quality and solutions were prepared using deionized Milli-Q water. Sample bottles were washed before use with 10% HCl. To avoid contamination, only one bottle (polycarbonate, 60 ml) was used for sampling, centrifugation, precipitate treatment and analysis. Spectrophotometric analysis was performed with a CECIL CE 1011 spectrophotometer using a special cell with long optical length (100 mm) and small volume (10 ml).

First results indicate surface (10-15 m) SRP concentration of 12.3 nM (SD=4.7, N=50). This is above the blank value determined using natrium hydroxyde and hydrochloric acid as for the samples treatment ($b_k$=3.9 nM, SD=1.8) but is not consistent with orthophosphate concentration obtained from turnover times as proposed by Thingstad *et al.* (1999). Turnover time (T=[o-P]/V, [o-P] is the natural orthophosphate concentration and V the total uptake of orthophosphate) was obtained from $^{33}$P experiment (Thingstad *et al.,* 1993). The total required uptake may be indirectly obtained from bacterial production taking a C:P ratio of 50 and primary production taking a C:P ratio of 106. With considering $V=V_{Br}+V_{Pr}$ and the turnovertime, it is possible to determine o-P. Following this procedure, surface (10-15 m) phosphate concentration varied from 3 near the strait of Gibraltar to 0.2 nM in the ionian sea. The difference of about 10 nM observed between this calculation and the MAGIC method may be explained either by DOP hydrolysis during the acid treatment or by the fact that the real blank value for seawater could not be obtained. Whatever the explanation, it seems reasonable to consider as a reference the value obtained at surface from the turnovertime. This latter value is then taken as the " blank " for the determination of o-P concentration with the MAGIC procedure.

This intricate procedure seems to be the only one which can provide a reasonable picture of the distribution of o-P concentration in surface

waters of the Mediterranean Sea. A new detection limit of 5 nM seems to be reasonable. This concentration deapen from the strait of Gibraltar (about 10 m) to the M IO sîte in the ionian sea (about 90 m).

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## DATA SET

### Phosphate PROSOPE

**Modified MAGIC procedure**

| CTD | bouteille | profondeur en m | [PO4] nM |
|---|---|---|---|
| 9 | 20 | 11 | |
| 9 | 18 | 16 | 486 |
| 9 | 16 | 21 | 420 |
| 9 | 14 | 26 | 429 |
| 9 | 12 | 31 | 415 |
| 9 | 10 | 42 | 561 |
| 9 | 8 | 52 | |
| 9 | 6 | 61 | 702 |
| 9 | 4 | 76 | 797 |
| 9 | 2 | 92 | 745 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 11 | 20 | 5 | 0 |
| 11 | 18 | 11 | 3 |
| 11 | 16 | 20 | |
| 11 | 14 | 29 | 10 |
| 11 | 12 | 38 | 14 |
| 11 | 10 | 49 | 25 |
| 11 | 8 | 59 | 57 |
| 11 | 6 | 80 | 207 |
| 11 | 4 | 100 | 290 |
| 11 | 1 | 150 | 356 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 14 | 20 | 5 | |
| 14 | 18 | 15 | 2 |
| 14 | 16 | 29 | 15 |
| 14 | 14 | 40 | 39 |
| 14 | 12 | 45 | 66 |
| 14 | 10 | 60 | 225 |
| 14 | 8 | 69 | 250 |
| 14 | 6 | 90 | 176 |
| 14 | 4 | 110 | 210 |
| 14 | 1 | 150 | 303 |

| CTD | bouteille | profondeur en m | [PO4] nM |
|---|---|---|---|
| 17 | 20 | 5 | 0 |
| 17 | 18 | 10 | 1 |
| 17 | 16 | 25 | 6 |
| 17 | 14 | 40 | 42 |
| 17 | 12 | 55 | 156 |
| 17 | 10 | 70 | 185 |
| 17 | 8 | 80 | 79 |
| 17 | 6 | 94 | 28 |
| 17 | 4 | 109 | 37 |
| 17 | 1 | 151 | 138 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 20 | 20 | 7 | 0 |
| 20 | 18 | 13 | 0 |
| 20 | 16 | 27 | 0 |
| 20 | 14 | 41 | 4 |
| 20 | 12 | 61 | 21 |
| 20 | 10 | 77 | 52 |
| 20 | 8 | 90 | 115 |
| 20 | 6 | 105 | 148 |
| 20 | 4 | 122 | 133 |
| 20 | 1 | 150 | 164 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 23 | 20 | 6 | 0 |
| 23 | 18 | 11 | 0 |
| 23 | 16 | 23 | 0 |
| 23 | 14 | 40 | 0 |
| 23 | 12 | 55 | 11 |
| 23 | 10 | 65 | 20 |
| 23 | 8 | 80 | 58 |
| 23 | 6 | 95 | 59 |
| 23 | 4 | 120 | 122 |
| 23 | 1 | 150 | 127 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 26 | 20 | 6 | 0 |
| 26 | 18 | 10 | 0 |
| 26 | 16 | 29 | |
| 26 | 14 | 50 | 1 |
| 26 | 12 | 70 | 0 |
| 26 | 10 | 85 | 0 |
| 26 | 8 | 98 | 6 |
| 26 | 6 | 115 | 8 |
| 26 | 4 | 140 | 39 |
| 26 | 1 | 170 | 62 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 33 | 20 | 4 | 0 |
| 33 | 18 | 14 | 0 |
| 33 | 16 | 30 | 0 |
| 33 | 13 | 50 | 2 |

| | | | |
|---|---|---|---|
| 33 | 10 | 70 | 3 |
| 33 | 8 | 90 | 5 |
| 33 | 6 | 100 | 9 |
| 33 | 4 | 131 | 14 |
| 33 | 2 | 150 | 25 |
| 33 | 1 | 200 | 83 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 44 | 20 | 7 | 0 |
| 44 | 18 | 17 | 0 |
| 44 | 16 | 32 | 1 |
| 44 | 14 | 50 | |
| 44 | 12 | 70 | 3 |
| 44 | 10 | 90 | 4 |
| 44 | 8 | 109 | 6 |
| 44 | 6 | 130 | 14 |
| 44 | 4 | 150 | 30 |
| 44 | 2 | 200 | 93 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 60 | 20 | 7 | 0 |
| 60 | 18 | 17 | 0 |
| 60 | 16 | 32 | 0 |
| 60 | 14 | 50 | 0 |
| 60 | 12 | 75 | 0 |
| 60 | 10 | 90 | 0 |
| 60 | 8 | 110 | 2 |
| 60 | 6 | 130 | 21 |
| 60 | 4 | 150 | 27 |
| 60 | 2 | 200 | 97 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 63 | 20 | 4 | 0 |
| 63 | 18 | 14 | 0 |
| 63 | 16 | 30 | 0 |
| 63 | 14 | 50 | 0 |
| 63 | 12 | 70 | 0 |
| 63 | 10 | 90 | 0 |
| 63 | 8 | 110 | 17 |
| 63 | 6 | 130 | 33 |
| 63 | 4 | 150 | 46 |
| 63 | 2 | 200 | 77 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 68 | 20 | 5 | 4 |
| 68 | 18 | 15 | 0 |
| 68 | 16 | 30 | 0 |
| 68 | 14 | 50 | 0 |
| 68 | 12 | 71 | 10 |
| 68 | 10 | 90 | 12 |
| 68 | 8 | 110 | 44 |
| 68 | 6 | 130 | 103 |
| 68 | 4 | 150 | 133 |

| | | | |
|---|---|---|---|
| 68 | 2 | 200 | 180 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 70 | 20 | 5 | 0 |
| 70 | 18 | 15 | 0 |
| 70 | 16 | 30 | 0 |
| 70 | 14 | 50 | 4 |
| 70 | 12 | 64 | 2 |
| 70 | 10 | 75 | 15 |
| 70 | 8 | 90 | 46 |
| 70 | 6 | 110 | 103 |
| 70 | 4 | 129 | 142 |
| 70 | 2 | 150 | 173 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 73 | 20 | 4 | 0 |
| 73 | 18 | 15 | 0 |
| 73 | 16 | 25 | 6 |
| 73 | 14 | 40 | 8 |
| 73 | 12 | 45 | 3 |
| 73 | 10 | 60 | 96 |
| 73 | 8 | 75 | 225 |
| 73 | 6 | 90 | 251 |
| 73 | 4 | 110 | 250 |
| 73 | 2 | 151 | 298 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 78 | 20 | 4 | 4 |
| 78 | 18 | 9 | 0 |
| 78 | 12 | 29 | 5 |
| 78 | 10 | 39 | |
| 78 | 8 | 47 | 14 |
| 78 | 6 | 60 | 19 |
| 78 | 4 | 70 | 150 |
| 78 | 3 | 90 | 248 |
| 78 | 2 | 110 | 250 |
| 78 | 1 | 150 | 313 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 96 | 20 | 13 | 0 |
| 96 | 17 | 32 | 0 |
| 96 | 15 | 40 | 0 |
| 96 | 10 | 45 | 4 |
| 96 | 8 | 55 | 40 |
| 96 | 7 | 60 | 39 |
| 96 | 6 | 65 | 105 |
| 96 | 5 | 70 | 177 |
| 96 | 4 | 74 | 224 |
| 96 | 3 | 90 | 258 |
| 96 | 2 | 110 | 282 |
| 96 | 1 | 150 | 293 |
| **CTD** | **bouteille** | **profondeur en m** | **[PO4] nM** |
| 104 | 20 | 15 | 0 |

| | | | |
|---|---|---|---|
| 104 | 17 | 30 | 0 |
| 104 | 15 | 40 | |
| 104 | 14 | 45 | |
| 104 | 12 | 55 | 0 |
| 104 | 11 | 60 | 21 |
| 104 | 10 | 65 | 31 |
| 104 | 9 | 70 | 84 |
| 104 | 8 | 75 | 94 |
| 104 | 7 | 80 | 132 |
| 104 | 5 | 90 | 234 |
| 104 | 4 | 100 | 256 |
| 104 | 3 | 110 | 287 |
| 104 | 2 | 130 | 309 |
| 104 | 1 | 150 | 315 |