(2) $d = -(B', z') - \pi$, when $V_Z > 0$,
because the bearings are counted along the direction opposite to the trigonometric direction in the horizontal plane OX, OY.

The sign of V_Z being known, the sign indeterminations on p and π of on d are cleared, those indeterminations being unavoidable since there is no privileged direction in the arrangement of the accelerometers and the magnetometers.

The calculations of the coordinates a, b, c of the vector $\vec{Z}$ in the trihedral Ox, Oy, Oz will now be described.

The following equations result:

$$a^2 + b^2 + c^2 = 1 \quad (1)$$

$$\frac{-\vec{Z}.\vec{B}}{B} = \cos A \text{ because } (-\vec{Z}, \vec{B}) = A,$$

where A is the constant angle between the vertical line of the spot and the earth magnetic field, B is the constant modulus of the magnetic field, A and B depending on the anchoring spot only.

Furthermore, $\vec{Z}$, $\vec{G}$ and $\vec{z}$ being coplanar, then:

$$\vec{Z}(\vec{G} \wedge \vec{z}) = 0.$$

This equation when developed gives, with (1):

$$a^2 + b^2 + c^2 = 1 \quad (1)$$

$$a.Bx + b.Bx + c.Bz = -B.\cos A \quad (2)$$

$$a.Gy - b.Gx = 0 \quad (3)$$

resulting in:

$$a = \lambda.\ Gx \quad (4)$$

$$b = \lambda.\ Gy$$

$$c = -\frac{B.\cos A}{Bz} - \lambda.\frac{Bx.Gx + By.Gy}{Bz}$$

The values a, b, c of the equation (1) being replaced by their values in the system (4), the solution of the hereunder equation (5) gives the parameter λ:

$$0 = \lambda^2.\left[(Gx^2 + Gy^2) + \left(\frac{Bx.Gx + By.Gy}{Bz}\right)^2\right] + 2\lambda.\frac{B.\cos A(Bx.Gx + By.Gy)}{Bz^2} - \left(1 - \frac{B^2.\cos^2 A}{Bz^2}\right) \quad (5)$$

With:

$$Go = (Gx^2 + Gy^2)^{\frac{1}{2}}$$

$$K = (Bx.Gx + By.Gy).Bz^{-1}$$

$$L = B.\cos A.Bz^{-1}$$

equation (5) becomes:

$$\lambda^2(Go^2 + K^2) + 2\lambda LK - (1 - L^2) = 0$$

and then:

$$c = -(L + \lambda K)$$

The λ equation (5) is thus a quadratic equation which has two roots: $\lambda\mathbf{1}$ et $\lambda\mathbf{2}$, defining two vectors $\vec{Z1}$(a1,b1,c1) and $\vec{Z2}$(a2,b2,c2). Such a double solution is understandable in geometry, because Z results from the intersection of a plane containing $\vec{G}$ et $\vec{z}$, with the cone defined by axis B and aperture A.

It will be noted that Go, K and L are calculated from the measurements made by accelerometers G1, G2, magnometers B1, B2, B3, while B and A are already known. Therefore, it is quite possible to calculate the values of.

For obtaining the value of the slope p, the vertical speed of the buoy will first be calculated by taking into account the values related to the rectangular-coordinate system defined by the root $\vec{Z1}$ of equation (5).

$$V_{Z1} = \int_0^{+} \vec{Z1}.(\vec{G} - \vec{g})dt$$

or:

$$V_{Z1} = \int_0^{+} (a1.Gx + b1.Gy + c1.Gz + g)dt$$

because $\vec{g}$ is oriented downwards, or also:

$$V_{Z1} = \int_0^{+} [\lambda 1.Gx^2 + \lambda 1.Gy^2 - (L + \lambda 1.K).Gz + g]\,dt$$

or:

$$V_{Z1} = \int_0^{+} [\lambda 1(Go^2 - K.Gz) - L.Gz + g]dt \quad (6)$$

The equation (6) provides the sign of V_{Z1} and, on the other hand, c1 is equal to $-(L + \lambda K)$, therefore:

$$p1 = -(\text{sign } V_{Z1}) \text{ Arc cos } c1$$

It can be noted that c1 and c2 are always positive since the absolute value is lower than 90°. Furthermore, equations (4) and (1), also give the results:

$$c1 = (1 - \lambda 1^2.Go^2)^{\frac{1}{2}}$$

Of course, the last calculations on $\lambda\mathbf{1}$ are also convenient for calculating $\lambda\mathbf{2}$.

The projection $\vec{z'}\mathbf{1}$ of $\vec{z}$ on the horizontal plane OX1, OY1, defined by $\vec{Z1}$, will now be calculated:

$$\vec{z'}1.\vec{Z1} = 0$$

$$(\vec{z} - \vec{z'}1)\ \vec{Z1} = 0$$

or, with $\vec{z'}1(\alpha 1, \beta 1, \gamma 1)$,

$$\alpha 1.a1 + \beta 1.b1 + \gamma 1.c1 = 0 \quad (8)$$

$$\alpha 1.b1 - a1.\beta 1 = 0$$

$$a1(\gamma 1 - 1) - \alpha 1c1 = 0 \quad (9)$$

$$\beta 1c1 - b1(\gamma 1 - 1) = 0$$

which results in: