Magellan's calculations are based on equations Talwani published in 1964. He takes a 2-d polygon and calculates the contribution from each site of the polygon to the magnetic anomaly at the origin of the coordinate system. The polygon is assumed to extend infinitely along the y-axis.

The calculated anomaly has two components, vertical and horizontal ones. Note that this anomaly is the measured magnetic field after the total magnetic field, at the time of formation of the lithosphere, has been removed. These components are given, respectively, by the following equations

$$V = 2(J_x Q - J_z P) \tag{1}$$

$$H = 2(J_x P + J_z Q) \tag{2}$$

where

$$P = \frac{z_{21}^2}{z_{21}^2 + x_{12}^2}(\theta_1 - \theta_2) + \frac{z_{21}x_{12}}{z_{21}^2 + x_{12}^2} log(\frac{r_2}{r_1}) \tag{3}$$

$$Q = \frac{z_{21}x_{12}}{z_{21}^2 + x_{12}^2}(\theta_1 - \theta_2) - \frac{z_{21}^2}{z_{21}^2 + x_{12}^2} log(\frac{r_2}{r_1}) \tag{4}$$

and additionally

$$x_{12} = x_1 - x_2, \quad z_{21} = z_2 - z_1,$$
$$r_1 = \sqrt{x_1^2 + z_1^2}, \quad r_2 = \sqrt{x_2^2 + z_2^2}$$

Here the $\vec{J}$ is the magnetization vector where its horizontal and vertical components are, respectively,

$$J_x = Jcos(I)cos(D - B) \quad J_z = Jsin(I)$$

Now, the magnetic anomalies that are measured arise due to magnetization of the oceanic floor and this magnetization is by induction (setja inn svona litla síðu sem útskýrir þetta), that is $\vec{J} = k\vec{F}$ where k is the magnetic susceptibility and $\vec{F}$ is the total magnetic field. Here I is the inclination of the total magnetic field, D is the declination and B is the strike of spreading direction clockwise from north.

The total anomaly vector is a projection of its horizontal and vertical components along the direction of $\vec{F}$

$$\vec{T} = Vsin(I) + Hcos(I)cos(C - D) \tag{5}$$

Magellan's algorythm is based on these equations and assumes that the total field is either in the direction of Earth's current magnetic field or in the reverse direction. For instance if we are calculating the contribution from a block that is reversly magnetized then we multiply $\vec{T}$ with a minus sign which results in a negative contribution from that block.