PHYSICAL ASTRONOMY. -The Sidereal Dissymmetry of Space and the Tidal Phenomenon. Note by Ernest Esclangon, presented by M. Deslandres.

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ASTRONOMIE PHYSIQUE. - La dissymétrie de L'space sidéral et la phénoméne des marées. Note de M. Ernest Esclangon, presentée par M. H. Deslandres.

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If sidereal space has a dynamic dissymmetry, due to the very high speed of the stellar galaxy or to other causes, the tides on the Earth could undergo an effect due to it.

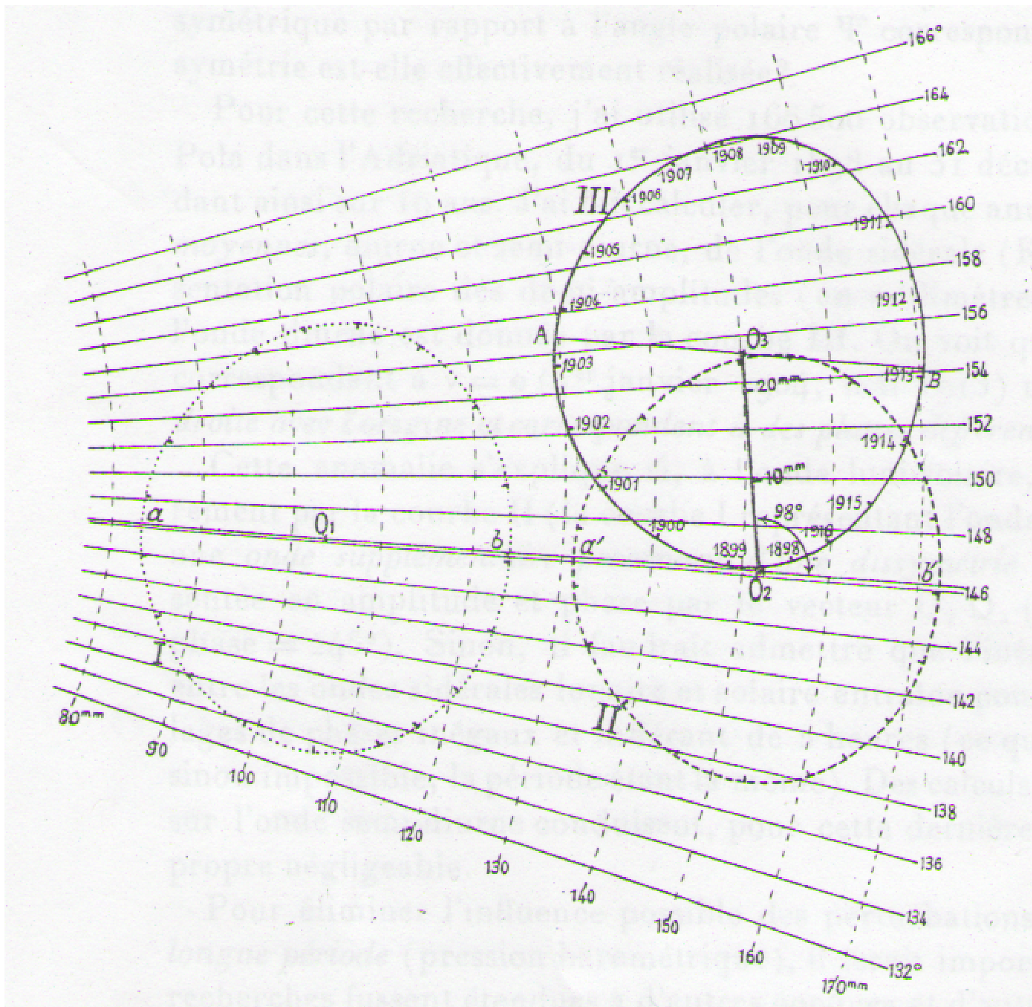
The theory of the tides, based on the attractions of the Sun and the moon, suggest the existence of a sidereal wave including a diurnal component and a semi-diurnal component. The diurnal component, in particular, is put in the form:

$$L \sin 2i * \cos(t-v-\varphi) + S \sin 2w \cos(t-\varphi) = A \cos(t-\varphi);$$

t is sidereal time; i and w slopes of the lunar and solar orbits on the equator (W = 23.27 '); v the right ascension of the node of the lunar orbit with the equator, surface φ, L, S of the constants particular to each place of observation (S/L = 0.458). This wave has a purely *artificial* existence, resulting from the development in series of the quasi periodic function representing the whole of the phenomenon.

However one can wonder whether this wave, mathematically to some extent, would not come to superimpose an additional wave, related to a real *physical cause* of the same period. Let us consider the lunar effect for example. At a given time, it depends only on the orbit of the Moon at that time, in particular of node v and inclination i. If, at another time, v having varied, i took again the same value, the phase had to follow the variations of v exactly, besides whatever the effective complication of the phenomenon.

However v varied periodically in 18 2/3 years, between - 13^o and + 13^o. With the same value of i, consequently to the same value of the amplitude, two values of v are equal and the contrary signs correspond. Let us make a representation in polar coordinates by taking as half radius vector it's amplitude A [formula (1)], as polar angle phase τ. If there does not exist any foreign sidereal wave, the representative curve obtained will be symmetrical compared to the polar angle ψ corresponding to v=0. Is this symmetry actually realized?



For this research, I used 166,500 observations with time with Pola in the Adriatic, from January 1st, 1898 to December 31st, 1916, thus extending over 19 years. I calculated, for each year, the average components, diurnal and semi-diurnal, of the sidereal wave (K1, and K2). The polar representation of the half-amplitudes (in millimetres) and the phases of the diurnal wave is given by curve III. It is seen that the points A and B corresponding to v = 0 (January 1st, 1904, May 1913) are not on straight line with the origin and correspond to different phases.

This anomaly is explained if, with the lunar-solar wave, represented on the polar-line by curve II (curve I represents the lunar wave), one adds an additional wave coming from a dissymmetry of space, represented in amplitude and phase by the vector 02 - 03 (amplitude = 50mm, phase = 245 deg.). If not, it would be necessary to admit that the inequality of amplitudes between the lunar and solar sidereal waves involves a shift of phases unequal and differing by 2 hours. (which is not very probable, if not impossible, the period being the same for both). The identical calculations carried out on the latter semi-diurnal wave lead to a negligible sidereal effect.

To eliminate the possible influence from the weather disturbances over long periods (i.e. barometric pressure), it would be important that same the study be extended to other times and other places.

Ultimately, the diurnal sidereal wave, calculated according to the observations, is well represented, for Pola, if the disturbances or waves for long periods were indeed eliminated, by the expression:

$$144mm*[\sin 2i + 0, 2\sin(i-w)]*\cos(t-v-146^{o}, I) + 48mm*\cos(t-146^{o},I) + 25mm*\cos(t - 244^{o},6).$$

The last term alone would represent the effect of a foreign sidereal dissymmetry to the lunar-solar action.