

# 2500 YEARS OF SPACE-TIME REFERENCES

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**ABSTRACT.** Time and space reference systems result from the historical developments of the observational techniques and concepts from Antiquity to nowadays. Moreover ancient observations, involving various techniques and epochs, are quite often reprocessed, because of the extension or modification of their compilations or for benefiting of the progress of the computer capabilities. These historical aspects constitute an other skill of SYRTE. For a better integration of our various researches and their achievements, and having an epistemological overview on them, we set up in 2013 an internal interdisciplinary group, assembling time and astro-geodesy competence centers with the historians. This is OMIM: “Observations, Mesures, Incertitude, Modèles” (i.e. Observations, Measurements, Uncertainties and Models). The present poster is aimed at illustrating the evolution in measuring/conceptualising space and time from the Greeks to our days.

## A BRIEF HISTORY OF THE SPACE-TIME APPREHENSION

Reference of time and space is the basis of any rational knowledge of our environment and permits to master the Nature and use it. The manner we coordinate objects in space and time takes its roots in the most ancient civilisations. A deep understanding of present space-time reference system cannot be restricted to the present technical achievement brought by atomic clocks and space geodesy, but has also to consider the long term maturation of time-space measurements in conjunction with the discoveries and physical theories they led.

A picture speaks better than words. Of the very rich history underlying the development of space-time references, we offer the synthetic representation in chronological order in the figure hereafter. It can be seen how the conceptual representation of space and time references is associated with the development of clocks and astrometry. If many discoveries and physical theories have resulted from technical advances or have been confirmed by them, the inverse is also true: the search for tiny celestial motions (parallaxes, aberration, proper motion,...), Earth shape (flattening, geoid, topography), and ground displacement (tides, continental drift,...) hinted by theoretical considerations has motivated many technical progresses, especially in optics and time keeping. The tremendous advances of these last 50 years are mostly due to the invention of atomic clocks, their improvement, and their introduction in space geodesy for determining angles and distances, so that in their practical realisation time and space references become totally entangled, as described by Relativity theory.

## REFERENCES

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