

THE ITALIAN CONTRIBUTION TO PROJECT MERIT

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The proposal for a programme of international cooperation to study Earth's rotation was forwarded and discussed in 1978 at IAU Symposium No. 82 "Time and Earth's rotation" (Mc Carthy and Pilkington Eds. 1979). A working group comprehensive of members of both IAU Commission 19 (Rotation of the Earth) and Commission 31 (Time) was appointed to promote an international programme of observation and analysis that will utilize both classical and new techniques to improve our knowledge and understanding of Earth's rotation.

The programme, called Project MERIT (Monitor Earth Rotation and Intercompare the Techniques of observation and analysis), was endorsed at the General Assemblies of the International Astronomical Union in Montreal and of the International Union of Geodesy and Geophysics in Canberra in 1979. Project MERIT was also endorsed by COSPAR and the International Council of Scientific Unions (Wilkins 1980).

One of the main scientific purposes of Project MERIT was the improvement of the observations for the determination of the variations in the Earth's rotation rate (changes in the length of the day) and of the motion of the axis of rotation respect to a terrestrial reference frame (polar motion) in order to obtain high precision astronomical data for a better understanding of geophysical and dynamical processes affecting Earth's rotation.

Further on, new techniques of observation such as Doppler tracking of satellites, Laser telemetry to artificial satellites (SLR) and to the Moon (LLR), Very Long Baseline Interferometry (VLBI) have been developed in the last years providing high precision data in parallel with the results obtained through optical instruments (astrolabes, transit instruments, visual and photographic zenith telescopes). All these techniques require to be coordinated also in view of a reorganisation of international services (BIH and IPMS) devoted to the analysis of Earth's rotation. For these reasons, intensive campaigns of observation have been promoted, a preliminary one in the period 1 August - 31 October 1980 and more recently the main campaign from 1 September 1983 to 31 October 1984.

Only few months after the end of this last campaign of observation, when the analysis of results is still outstanding, the evaluation of the Project MERIT is already largely positive and it can be considered as one of the most complex programmes of international cooperation in the field of Astronomy (Vicente 1984).

It is to be stressed that in the field of Optical Astrometry 53 stations with 63 instruments have provided time results and 59 instruments in 58 stations have provided latitude determinations, with an estimated accuracy of $0^{\text{s}}.0002$ and $0''.003$ respectively (Yokoyama 1984).

The Italian contribution in the field of Optical Astrometry has been forwarded at the Observatory of Cagliari (Astrolabe and Visual Zenith Telescope), Carloforte (Visual Zenith Telescope), Merate (Astrolabe), Roma (Visual Transit Instrument) and Torino (Photoelectric Transit Instrument). About 500 nights of observation made during the MERIT Campaign, and partially also past results, have been reduced or are still in course of reduction accordingly to MERIT standards, i.e. on the base of the 1976 IAU System of Astronomical Constants,

the 1980 IAU Theory of Nutation and the FK5 System.

The results obtained in the five Italian stations and the comparisons among the various instruments are in course of analysis by a working group constituted by the same authors. From a preliminary analysis of the whole series of results obtained in the Italian stations, it is expected to obtain an estimation of the Earth's rotation parameters better than 3-4 milliseconds of time and a remarkable improvement of catalogue positions for the about 500 stars belonging to the programmes of observation.

Doppler tracking of satellites at Cagliari and Laser telemetry to satellites at Matera complete the general view of Italian participation to Project MERIT.

Figure 1 shows the variation of UT1-TAI corrected for a term ($0.0015/\text{day}$) corresponding to the mean value of slowing down of the Earth's rotation rate in the last period. Seasonal and irregular variations are then put into evidence.

The dotted line represents the values calculated by the Bureau International de l'Heure (BIH) through a global solution of the results obtained all over the world with various techniques (Optical Astrometry, LLR, SLR, Doppler and VLBI).

The continuous line shows the values obtained by the Italian stations in the field of Optical Astrometry.

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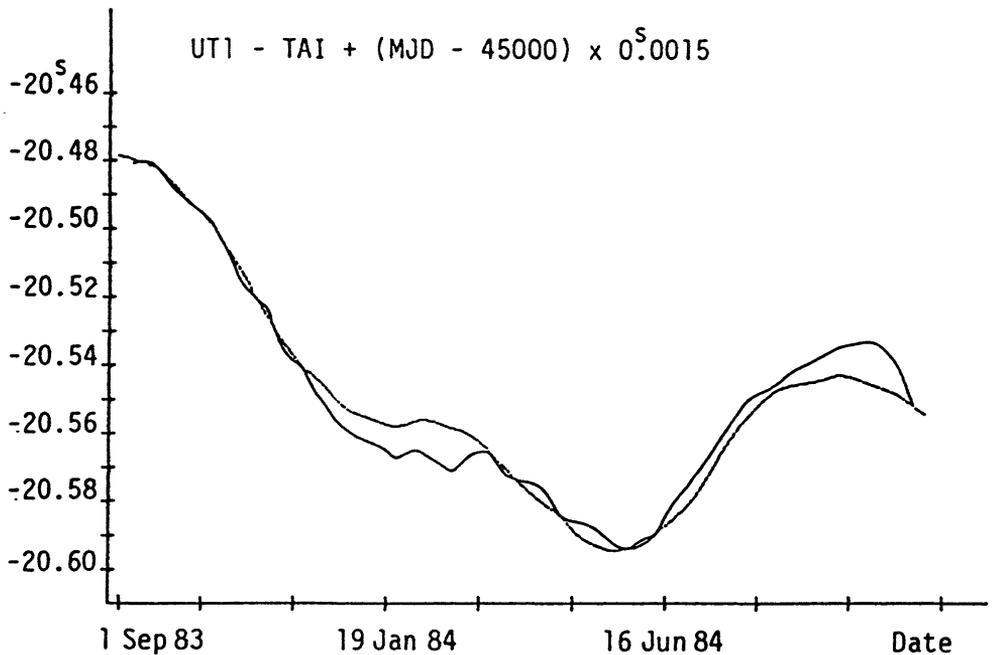


Fig. 1: Variation of UT1-TAI obtained by BIH solution (dotted line) and Italian stations (continuous line). The difference UT1-TAI is, at present, about 22 s as a consequence of the slowing down of the Earth since 1955.5 (origin of the atomic time scale).

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