The realization of precise and reliable global geodetic reference frames is one of the innovations that have most contributed to the efficiency of positioning techniques, i.e. for monitoring surveys, land surveying and cadastral procedures, the stacking-out of large infrastructures, or for maritime, terrestrial and aerial navigation.

Starting from the initial applications exclusively conducted by research institutions, we can now observe a wide dissemination of the techniques of space geodesy for consumer applications, and it is sufficient to cite satellite car navigation systems or applications based on global positioning installed in smartphones or tablets PC.

The reference frame more accurate is the International Terrestrial Reference Frame (ITRF) maintained by the International Earth Rotation and Reference Systems Service (IERS). The update of ITRF, entirely depends on the voluntary effort of a large number of agencies and research infrastructures, this creates a fundamental relationship between public and private, national and global technical services. This reference frame is now the backbone also for the realization of national reference frames. For example, in Italy the Presidency of the Council of Ministers established by the Decree of 10 November 2011, the institution of the Rete Dinamica Nazionale (RDN) as official national reference frame, composed by 99 GNSS permanent stations.

A team of DICAM studied in collaboration with the Institute of Radio Astronomy (IRA-INAF) the ensemble of high-accuracy survey methodologies and geometrical/statistical procedures necessary for the measure of eccentricity vectors between the reference points (RP) of co-located geodetic instruments and a WG was established in 2003 within the IERS - IAG Sub-Commission 1.2. Moreover DICAM is involved both in real time GNSS network for NRTK positioning and for the RDN analysis by means of the most advanced scientific GNSS data processing packages.

![Fig. 1. Geodetic measurements for the estimation of the tie-vectors GPS-VLBI at the IRA INAF observatories of Medicina (BO) and Noto (SR), Italy, (picture by Vittuari).](image1)

![Fig. 2. Residual velocities in ETRF of GNSS permanent stations belonging the Rete Dinamica Nazionale (RDN), (picture by Gandolfi).](image2)
MAIN PUBLICATIONS


RESEARCH PROJECTS

PRIN 2007: “Uso degli osservatori geodeticici co-locati VLBI-GPS per l’omogeneizzazione ed il confronto di serie storiche derivate da PS INSAR e livellazione geometrica, nello studio dei movimenti del suolo a scala regionale” (National PI A. Capra).

CISIS 2011 e 2012: Monitoraggio della Rete Dinamica Nazionale Italiana (RDN)

Accordo di collaborazione ARPAE-DICAM su: “Definizione sistema di riferimento per rilievi topografici e batimetrici lungo il litorale emiliano-romagnolo”.


LINKS AND CONTACTS

maurizio.barbarella@unibo.it
stefano.gandolfi@unibo.it
luca.vittuari@unibo.it
antonio.zanutta@unibo.it