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JTRF2014, the JPL Realization of the ITRS

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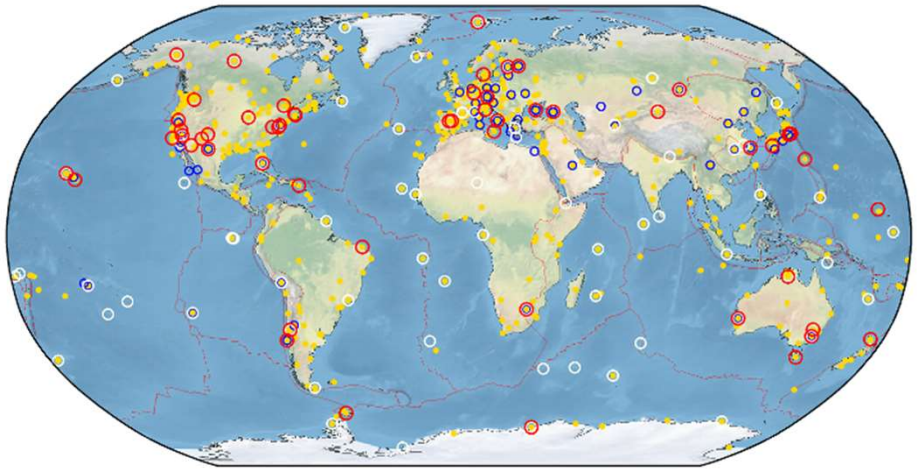

Global space-geodetic network used to determine JTRF2014. Gold dots are GNSS sites (671); Red circles are VLBI (71); Blue circles are SLR sites (71); White circles are DORIS sites (159). Polygons in red represent tectonic plate boundaries.

JTRF2014, the JPL Kalman filter and smoother realization of the International Terrestrial Reference System
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Link to EOS Research Spotlight
https://eos.org/research-spotlights/a-new-baseline-to-monitor-earths-dynamic-surface

Science Question: How can we improve the definition of a global terrestrial reference frame (TRF)? How can we provide the geodetic and geophysical community with an enhanced TRF wherein the complex spatiotemporal variability of Earth's surface deformation is more accurately represented? To address these questions, we've been developing a Kalman filter approach to TRF determination.

Data & Results: JTRF2014 is constructed by assimilating station positions and Earth Orientation Parameters (EOPs) from VLBI, GNSS, SLR, and DORIS with a Kalman Filter and Smoother approach. Through the adoption of a station motion model based on linear trends and seasonal modes along with random walk-based process noise, JTRF is able to represent linear and non-linear variations of the Earth's surface deformation and of the geocenter motion at a sub-secular timescale. We found that (i) JTRF computational approach allows aliasing effects of non-linear motion into the frame defining parameters to be significantly reduced; (ii) JTRF2014 is highly consistent with ITRF2014, the standard TRF universally adopted by the geodesists and geophysicists; (iii) the JTRF2014-derived geocenter motion is in striking agreement with quasi-independent estimates obtained from inverting geophysical data and models; **Significance:** JTRF is the first example of a sub-secular TRF made available to the geodetic community. Given its sub-secular nature, JTRF2014 provides the ideal frame to investigate Earth's deformation at seasonal and sub-seasonal frequencies. An enhanced TRF is particularly critical for societal and scientific applications such as sea-level variations studies: JTRF2014 is available to all users including for adoption in satellite altimetry data reduction procedures to determine global sea level variations.