Interpolating the ITRF velocity field using least squares collocation method

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In order to apply directly the No Net Rotation Condition on ITRF, we aim at computing a regularly spaced velocity field and its covariance matrix. As the sites of the ITRF are scattered, we interpolate the ITRF horizontal velocity field to the nodes of a regular grid. The method takes into account the spatial correlation among the velocities, allows to interpolate velocities to regular spaced points and provides as well an estimation of the covariance matrix of the interpolated velocities. Moreover, the retained approach is valid all over the earth and not only locally.

We use a least-squares collocation method on the sphere. A mean rigid body rotation is removed from the velocities prior to interpolation. The interpolation is applied over the angular velocity field, rather than over the horizontal velocity field itself. This allows : (1) to preserve the spherical motion characteristic of the velocity field and (2) to define a covariance model which is independant from the coordinate system and then remain valid on large areas.

A covariogram is computed for plates that provide enough sites such as Eurasia and North America to define an isotropic covariance function, giving the necessary spatial correlation between velocities.

The method is applied to the interpolation of the ITRF horizontal velocity field of the most geodetically populated plates namely Eurasia and North America.