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Geokinematics of Central Europe: new insights from the CERGOP-2/Environment Project

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The Central European Geodynamics Project CERGOP/2 funded by the European Union from 2003 to 2006 under the 5^{th} Framework Programme benefits from repeated measurements of the coordinates of epoch and permanent GPS stations forming the Central European GPS Reference Network (CEGRN) in Central Europe, starting 1994. We report on the results of the systematic processing of the available data up to

2005. The analysis work has yielded the velocities of some 60 sites, covering a variety of Central European tectonic provinces, from the Adria indenter to the Tauern window, the Dinarides, the Pannonian basin, the Vrancea Seismic Zone and the Carpathian Mountains. The estimated velocities define kinematical patterns which outline, with varying spatial resolution depending on the station density and history, the present day surface kinematics in Central Europe. The horizontal velocities are analyzed after removal from the ITRF2000 estimated velocities of a rigid rotation accounting for the mean motion of Europe,: a $\sim$2.3 mm/yr north-south oriented convergence rate between Adria and the Southern Alps can be considered the present day velocity of the Adria indenter relative to the European foreland. An eastward extrusion zone initiates at the Tauern Window. The lateral eastward flow towards the Pannonian basin exhibits a gentle gradient from 1-1.5 mm/yr immediately east of the Tauern Window to zero in the Pannonian basin. This kinematic continuity implies that the Pannonian plate fragment recently suggested by seismic data does not require a specific Eulerian pole. In the southeastern boundary of the Adria microplate, we report a velocity drop from 4-4.5 mm/yr motion near Matera to $\sim$1 mm/yr north of the Dinarides, in the southwestern part of the Pannonian basin. A positive velocity gradient as one moves south from West Ukraine across Rumania and Bulgaria is estimated of 2 mm/yr on a scale of 600-800 km, as if the crust were dragged by the counterclockwise rotation along the North Anatolian Fault Zone. This regime apparently does not interfere with the Vrancea seismic zone: earthquakes there are sufficiently deep ($>$ 100 km) that the brittle deformation at depth can be thought of as decoupled from the creep at the surface. We conclude that models of quaternary tectonics of Central and Eastern Europe should not neglect the long wavelength, nearly aseismic deformation affecting the upper crust in the Rumanian and Bulgarian regions.