A Mantle Flow Mechanism for the LatePaleozoic Large-Scale Vertical Motionsin the Parana Basin

1. PYSKLYWEC, R. N., and 2.,3. QUINTAS, M. C. L. 1. Dept. ofOceanography, Dalhousie University,Halifax, Canada; 2. Dept. of Physics,University of Toronto, Toronto, Canada;3. Universidade Federal do Parana, Curitiba, Brasil

The Carboniferous-Permian stage in theevolution of the Parana Basin ischaracterised by the long-wavelengthdeposition of up to ~2.5 km of sedimentin the continental interior. Thetectonics of the region during this timewere dominated by convergence and activesubduction along the nearby Panthalassanmargin of Gondwana. While subsidence inthe basin is clearly related to themajor tectonic events at the platemargin, there is a distinct delaybetween the onset of subduction and theinitiation of basin deposition. This, and the nature of basinstratigraphy, suggests that thelarge-scale vertical motions of thecontinent may have been the dynamicresponse of the lithosphere to mantleflow associated with the penetration ofaccumulated slab material through thephase change at 660 km depth. We presentnumerical simulations of mantleconvection which show that subductingslabs can stagnate at the 660 km depthphase change and intermittentlypenetrate though. The associated(negative) dynamic topography remains atrelatively low amplitudes, and thenincreases rapidly to a maximum duringthe phase of penetrative flow. We findthat the predicted delay time betweeninitial descent of the slab and themaximum surface topography correspondswith the evidence from the geologicalrecord. Furthermore, models ofsedimentation show a close fit to theamplitude and horizontal lengthscale ofactual material accumulation in theParana Basin.