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Seismic model of the lithosphere in Trans-European Suture Zone in Poland

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The structure and evolution of the contact between Precambrian Europe to the northeast and Phanerozoic terranes to the southwest (the Trans-European Suture Zone, TESZ) is one of the main tectonic questions in Europe. The TESZ is a broad, structurally complex zone of middle to late Palaeozoic accretion and deformation that separates the Precambrian terranes of the Baltic shield and East European craton (EEC) from the younger terranes to the south and west. To create a seimic model of the TESZ lithosphere in Central Europe we aplied different method of interpretation of data recorded along the P4 profile during the POLONAISE'97 and SUDETES 2003 experiments based on P- and S-waves. Results of 2-D raytracing, tomography, receiver function and P-residuals methods provide the following conclusions: (a) the Polish basin is a large structure (125 km wide) filled with sedimentary strata (Vp $<$ 6.0 km/s) to about 20 km depth. This basin is asymmetric with its northeast margin being most abrupt. (b) The East European craton has thick ($\sim$ 45 km) three-layered crust. (c) The crystalline crust under this basin is only about 20 km thick today indicating that the lithosphere of Baltica was either thinned drastically or terminated along the northeast margin of the basin; the crust of the accreted terranes to the southwest is relatively thin and similar to that found in other non-cratonal areas of western Europe. (d) The lower crust is relatively fast (Vp $>$ 7.0 km/s) along most of the P4 profile. However, lower values to the southwest may indicate the termination of Baltica. (e) High velocity ($\sim$8.35 km/s) uppermost mantle lies beneath the Avalonia/Variscan terranes, and may be due to rifting and/or subduction. (f) Reflections from within the mantle lithosphere in the southwest suggest the presence of a northwest-dipping body in the mantle. (g) The seismic lithosphere thickness for the EEC is 230 km while it is only 120 km in

the Paleozoic Platform. Several tectonic models are consistent with the observed velocity structure but they all involve an abrupt discontinuity in lithospheric structure at the southwest edge of the EEC. Also, suturing along structures with moderate dips appears evident. In any case, the Variscan orogeny appears to be a “soft” collision in this region that did not greatly deform the pre-Permian strata ($\sim$15 km thick) in the Polish basin associated with the rifted margin of Baltica.