Great and old earthquakes against great and old paradigms – paradoxes, historical roots, alternative answers

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Case-history extreme-magnitude earthquakes are reviewed to highlight the overall analogies. The similarity of the vertical displacements shown by these earthquakes (Chile 1960, Alaska 1964, Sumatra 2004, ...) leads to a common interpretation necessitating resort to a prevailing uprising of lithospheric material. This interpretation is supported by the inspection of the irregularities of the hypocentre distribution along the Wadati-Benioff zones. Moreover, in the case of great South American earthquakes, a volcanic eruptions-earthquakes correlation is clearly recognisable.

Finally, the precise clues of the displacement of the Earth's instantaneous rotation pole – observed at ASI of Matera, Italy – the seismic data (USGS) in the two days following the main shock, the high frequency P-wave radiation, the geomorphologic data, and the satellite data of uplift/subsidence of the coasts (IGG) allow a new interpretation of the Great Sumatran earthquake (TU=26 December 2004 - 00h 58m, Lat=3.3˚N, Lon=95.8˚E, H=10 km, M=9.3) based on the second conjugate – nearly vertical CMT fault plane solution. Only a nearly vertical fault – in a non-double-couple treatment that considers non-negligible non-elastic contributions to the earthquake phenomena – can explain both high values of seismic moment and the ≈3.0 mas (≈10 cm), polhody displacement toward a azimuth exactly opposite to the epicentre azimuth.

All this converges toward different causes of seismogenetic precesses, strongly supporting a deep origin of disturbances, phase changes and fluxes of materials leading to sudden movements of masses, which leads to earthquakes on Wadati-Benioff zones. A thorough revision of the pure elastic rebound model of great earthquakes occurrence and a complete overcoming of the large scale subduction concept is then needed, to allow a greater adherence of the seismic risk/forecasting programs to the natural phenomena.

Key words: great earthquakes, volcanic eruptions, polar motion, geodynamics