

UNVEILING THE ENIGMA OF THE SERRA DE TOMBADOR, MATO GROSSO, BRAZIL, EARTHQUAKE OF JAN. 31, 1955, THE LARGEST ($m_b = 6.6$) KNOWN BRAZILIAN EVENT

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Fifty years after the occurrence of the largest known Brazilian intraplate earthquake ($m_b = 6.6$, 1955 JAN 31) there remains doubts about its true location. Early hypocentral/epicentral determinations and a more recent relocalization [Engdahl, 2002, personal communication] put this event in the area of the Serra do Tombador, north of Mato Grosso state [represented by ISS location: OT 05h03m03s, -12.5° and -57.4° , depth normal]. Strangely enough, since 1955 no other events have been detected in the Serra do Tombador area (*NB*: the detection threshold in the overall area of north of Mato Grosso state is around than $2.5 m_b$). Instead, as regional station coverage, quality of data and location procedures improved, all located events (magnitudes larger than $m_b \approx 2.5$) converge to the Portos dos Gauchos area, situated some 120 km to the NNE of the 1955 locations. In the Portos dos Gauchos area occurred the second largest event in this region (1998 MAR 10, $m_b = 5.3$ [ISC]). This recent event is located by various agencies [EIDC, NEIC, ISC or OBSIS (Seismological Obs., Brasilia, DF)], close to the (*adopted*) *average epicenter* (-11.6° and -56.8°) of the persistent aftershock activity as determined by a local network installed shortly after the 1998 mainshock. Given the striking difference between the locations of the 1955 and more recent events, we investigate relocation of the 1955 mainshock using the original phase data and recent developments and accumulated knowledge in earthquake location procedure. Hence, we screened the original ISS phase and station position data and adopted for location a new probabilistic earthquake location with non-linear, global-search method (NonLinLoc, Lomax, 2005), with the ak135 velocity model. Using the 200+ ISS listed phases we got NonLinLoc locations within a few 10's of km from earlier 1955 locations. When we consider the epicentral and azimuthal station distribution effects, it emerged that using "near", regional stations only the solution does not differs from that using "all", global stations. However, when using "far" stations only ($\Delta \geq 30^\circ$), that is removing regional stations mostly grouped along the subduction and tectonic zones to west and north, the epicenter is shifted to only 54 km from the recent persistent aftershock activity. Moreover, the location PDF (probability density function) cloud does not overlap the old 1955 epicenter but rather is compatible (for a proper station distribution) with the 1998 location and the persistent aftershock activity. These are not formal relative locations, but our results always show a similar relative position, so there is a strong indication that the two events might be in the same area. In summary, we find compelling evidence that the Serra do Tombador location for the 1955 epicenter is a biased result due to inherent limitations of the available data, and that the true epicenter of the 1955 earthquake is compatible with the active seismic area of Porto dos Gauchos.