Eric Peter OLDS, 2018. Impacts and exposed lithospheric mantle: A way to recognize large terrestrial impact basins?. *Acta Geologica Sinica* (English Edition), 92(supp.2):7.

Impacts and Exposed Lithospheric Mantle: A Way to Recognize large Terrestrial Impact basins?

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Abstract

Orientale size craters are not recognized on Earth nor expected for Phanerozoic and Proterozoic eons from conventional crater size frequency distributions (Ivanov et al., 2002). Here suggested are three such Phanerozoic craters, modified by plate tectonics, and tentatively correlated with extinction and "ophiolite obduction" events. Hypothesis testing is proposed and plate tectonics implications are discussed. Such basins might manifest:

• circular to elliptical rims (or rim segments), with exposed lithospheric mantle, as strain markers for plate boundary motion;

• thick ejecta near rim expressed as "ophiolitic melange";

• power law decay of ejecta thickness with radial distance from rim (McGetchin et al., 1973) and/or systematic azimuthal variation of ejecta thickness for low angle impacts (Schultz, 1999);

• weathering resistant shocked mantle minerals (Bohor et al., 1990) in ejecta;• global spherule layer with PGE anomalies (Alvarez et al., 1980);

• rim structures consistent with cratering mechanics (Melosh, 1989; Kenkmann, 2014);

• impact melt basement (Grieve et al., 1992; Pierazzo et al. 2000) recording uniform cooling age and Earth's magnetic polarity of the time.Tentatively suggested Phanerozoic impact basins:

• Yucatan Basin: Greater Antilles ophiolite rim – KPg Boundary? Maastrichtian ophiolite obduction in southeast Cuba (Iturralde-Vinent et al., 2006).

• Sulu Sea Basin: Palawan, Sabah etc. ophiolite rim – Middle Miocene Disruption? MM ophiolitic mélange emplacement in Sabah (Clennell,1991).

• Loyalty Basin: New Caledonia ophiolite and d'Entrecasteaux ridge rim – EO Boundary? EO ophiolite obduction in New Caledonia (Cluzel et al., 2012).

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