Geophysical Research Abstracts
Vol. 20, EGU2018-13382, 2018
EGU General Assembly 2018


# Stratigraphic framework for the plume mode of mantle convection

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Mantle convection is a fundamental planetary process. Its plate mode is well established and expressed by plate tectonics and vertical motion parallel to active plate margins; its plume mode is equally well established and expressed by interregional-scale geological features and patterns; I developed a theoretical stratigraphic framework to translate the surface effects predicted by the plume mode, which also serves as a methodology to analyze continent-scale geological maps based on unconformities and hiatuses. The surface expression of ascending plumes lasts for tens of millions of years and leaves a distinct record, not only as a > 1-km-high dome above the plume center, but also above the plume head margins and in distal regions (> 1200 km). Regional-scale erosion of the uplifting dome dominates prior to arrival of the plume head at the base of the lithosphere, and is followed by mechanical extensional collapse (narrow rifting), emplacement of giant dike swarms and flood-basalt eruption. This results formation of distinct erosional surfaces that grade laterally into broad depositional environments. A nearly complete sedimentary record may be preserved in these distal regions, which did not experience any plume-related uplift. Distal regions may be dominated by other processes, such that the sediments contributed from the plume-event may only be recognized based on their provenance and transport directions. The stratigraphic pattern expected fort he marginal region of the uplifted dome (plume margin) is the most complex, because it undergoes episodes of uplift with erosion followed by subsidence with sedimentation (first inversion), and renewed uplift (second inversion) with erosion as the plume head collapses and spreads laterally where it is associated with broad lithospheric-scale rifting (ocean opening). Thus, „plume-margin“ regions contain regional-scale “double-unconformity-bounded” stratigraphic successions that may be best preserved within marine stratigraphic successions at passive margins. Complete global stratigraphic synthesis of plate interiors requires integration of plate- and plume-stratigraphic frameworks. This plume-stratigraphic framework is event-based, interregional, but not global, with time-dependent amplitudes that are significantly larger than global eustatic sea-level fluctuations.