ABSTRACT FINAL ID: V53G-03;

TITLE: Motion of Hawaii and Louisville hotspots: Comparision of modeling results with new age and paleolatitude data *(Invited)*

SESSION TYPE: Oral

SESSION TITLE: V53G. Seamount Trails: Implications for Global Plate and Hotspot Motion, Mantle Flow, and the Geochemical Evolution of Mantle Plumes II

AUTHORS (FIRST NAME, LAST NAME): Bernhard M Steinberger[1, 2], John M O'Connor[3, 4], Anthony A P Koppers[5]

INSTITUTIONS (ALL): 1. Physics of the Earth, Helmholtz Centre Potsdam - GFZ, Potsdam, Germany.
2. Physics of Geological Processes, University of Oslo, Oslo, Norway.
3. GeoZentrum Nordbayern, University of Erlangen-Nürnberg, Erlangen, Germany.
4. FALW-Earth Sciences-Petrology, VU University, Amsterdam, Netherlands.
5. COAS, Oregon State University, Corvallis, OR, United States.

Title of Team:

ABSTRACT BODY: The bend in the Hawaiian-Emperor Chain is often seen as a consequence of Pacific plate motion change. Alternatively, it may record a change in motion of the Hawaii hotspot, or a combination of both. In order to devise a common reference frame for plate motions and flow in the mantle, which is needed to understand plate-mantle interaction, it is important to resolve that issue. Here we contribute towards that goal by comparing predictions of a geodynamic model of hotspot motion with new age and paleolatitude data from the Hawaiian-Emperor and Louisville chains. These are the two most prominent hotspot tracks on the Pacific plate and hence most suitable to constrain its motion. Comparing the age progression along both tracks can tell about the relative motion or fixity of the two hotspots, whereas paleo-latitude data ideally can resolve hotspot motion relative to the pole. However, their interpretation also needs to consider the possibility of true polar wander -- re-orientation of the entire Earth including the mantle relative to the pole. To model hotspot motion, we first compute large-scale mantle flow. Mantle density anomalies are inferred from seismic tomography models, assuming both density and seismic velocity anomalies are due to temperature anomalies, except in parts of the uppermost mantle (tectosphere) and possibly parts of the lowermost mantle (Large Low Shear Velocity Provinces). Radial mantle viscosity structure is chosen such that it is consistent with mineral physics, and the "Haskell average" inferred from postglacial rebound observations, and the model prediction of the geoid and global heat flux agrees well with observations. Time dependence is achieved by considering changes in plate motions and geometry as mantle flow boundary conditions, and advecting density anomalies back with the flow. Secondly we compute the motion of plume conduits in large-scale flow, assuming conduits are vertical at an initial time, and subsequently move with the flow, but in addition rise buoyantly. Results typically show the base of plume conduits moving towards the center of large-scale upwellings, as under the Central Pacific. In the case of Hawaii, this leads to a tilted conduit, and a southward motion, as the tilted conduit rises buoyantly. Predicted motion for Louisville is less strong, but tends to be also in southeastward direction. This is in line with new age data, which confirm that their distance has

decreased by several hundred km, mainly in the time interval 50-80 Ma, and an even larger southward motion of Hawaii inferred from paleomagnetic results obtained through ODP drilling of the Emperor chain.
www.geodynamics.no/steinberger

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SPONSOR NAME: Bernhard Steinberger

Additional Details

Previously Presented Material:

Contact Details

CONTACT (NAME ONLY): Bernhard Steinberger

CONTACT (E-MAIL ONLY): bstein@gfz-potsdam.de