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Equqtorial flattening of the cylindrical outer core

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Zhong et al.(2007),showed that the Africa supercontinent was formed after the Pangea(330Ma)in an initially by a spherical harmonic degree-1 form with the Pacific superplume. They suggested that the degree-1structure is responsible for supercontinent assembly with downwellings(Africa) and upwellings(Pacific).Recent studies show that light elements are transferred from the mantle to the outer core (OC) through the core-mantle boundary(CMB) and that the stably stratified layer are formed in the OC beneath the CMB. The stable layer shows the superadiabatic gradient, 1 Kkm-1 and its thermal conductivity is 150Wm-1K-1. The heat flux is over 100mWm-2.The heat flux of the mantle near the CMB is 100mWm-2 in the high temperature region (Perovskite) and 50mWm-2 in the low temperature region(Post-Perovskite). The heat flux flows into the low temperature region from the OC. We assume that the OC is a thin cylindrical rotating fluid around the rotating axis. The fluid shows a low frequency motion and the effects of flow pressure fluctuations on the density is ignored (Subseismic Approximation;Smylie and Rochester, 1981). The heat flux in the OC is expressed in the form of the exponential function of the central distance which decreases outward near the CMB. We derive the 1st order variations of the Potential. The azimuthal variation of the potential shows the variation of the equatorial flattening. The maximal value of its variation relative to the mean gravitational potential at the CMB is 1.1x10-5 (flattening). This value can be compared with the value of the equatorial flattening of the OC to be 6x10-6 obtained by Szeto and Xu(1997).

Keywords: thin cylindrical outer core, heat flux, heat flux in the mantle, potential, variation of potential, equatorial flattening of core