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Foreword: East-West Asymmetry of the Inner Core and Earth Rotational Dynamics

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In the last several years since 2004 an important new finding has been unveiled by combined efforts due to Japanese (Satoru Tanaka), French (Renaud Deguen, T Albousierre and Marc Monnereau), American and Chinese geophysicists (Xiaodong Song and Vernon F Cormier) who employed from unambiguous detailed seismological evidence and explained by clear theoretical and sound laboratory arguments drawn from fluid dynamics that there exists a strong East-West hemi-spherical asymmetry on the inner-outer core boundary, due to convective melting instability caused by a long-wavelength translational movement with spherical harmonic of degree one. Such a profound discovery would exert a profound impact in many branches of geophysics and also applied mathematics because of strong symmetry breaking of spherical geometry and challenges for traditional normal-mode theory pioneered by geophysicists in the 1960's, because the strong perturbation exceeds the regions of validity for linear perturbation theory. This would necessitate the development of new four-dimensional mathematical tools for handling the free-oscillation problem of a strongly lateral heterogeneous Earth. The purpose of this workshop held at the Institute of Geodesy and Geophysics in Wuhan on May 17–19, 2012 was to gather many outstanding experts drawn from various fields in solid-earth geophysics and applied mathematics in order to provide a common forum for exchange of valuable information. This represents a new constraint for geophysics, which can shed important information about transport properties of the inner core, such as its viscosity and thermal conductivity. Figure 1 below shows a schematic diagram of this east-west asymmetry, which was the central theme of this conference.

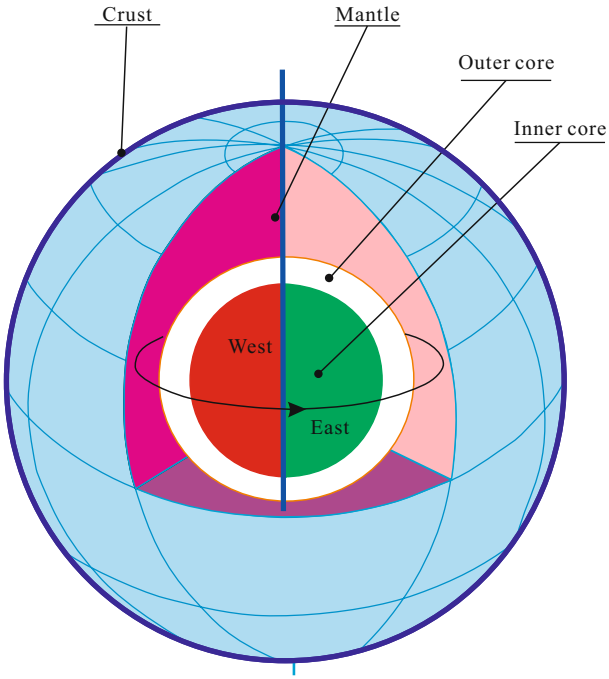

Figure 1. Schematic drawing showing the basic idea of the strong east-west asymmetry of the inner core due to melting of the inner-core boundary.

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