

Has the collapse of Pacific slab been started into Lower Mantle

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Pacific slab has been crossed over the upper boundary of lower mantle and started of collapse into lower mantle are discussed in this presentation.

M8.1 Earthquake with the depth of 682km happened off Ogasawara Islands in May 30 of 2015, which quaked all over the Japanese Islands with stronger than 1 of Japanese seismic scale, and indicated Pacific slab continue to the focus and the slab crossed the upper boundary of lower mantle with depth of 660km. Three days later, June 3 M5.6 in the same area with depth of 695km clearly showed Pacific slab reached into lower mantle. Focal mechanisms of the earthquakes were similar normal fault type.

The focal area was characterized with changes in the focal mechanism after East Japan Mega Earthquake 2011.3.11, and volcanic eruption at Nishinoshima Island. Hypocenter of Earthquake M7.3 of May 14, 2013 in the south of this area with depth of 619km indicated Mariana Slab of Pacific plate is overturning above the lower mantle boundary, continuing to concentric bending along trench. Izu slab subducts along Izu trench in the north of this area, with concentric bending and unbending into plane. The declination of planar slab increases southward, and lower mantle earthquakes occurred at the southern margin of Izu slab.

The lower mantle earthquakes have the deepest title superior the last title holder of April 18, 2009 M5.0 of 671km in Vladivostok area, of which depth was also below the depth 660km of lower mantle boundary. The upper mantle principal mineral of olivine leads to phase transition to perovskite of lower mantle under the pressure and temperature of the 660km depth in the Earth. Because the pressure for the transition is higher in the lower temperature, slab with lower temperature cannot transit and stagnate above the lower mantle boundary. Earthquakes within the stagnant slab occurred in Vladivostok area and the earthquakes have reverse fault type focal mechanism, however, the last title holder has strike-slip fault type focal mechanism. The difference in focal mechanism and the hypocenter in the deepest side with the warmest portion of the stagnant slab suggest that the last title holder was also lower mantle earthquake. If the stagnant slab has started to fall into lower mantle, the leading part of the transited slab to lower mantle should lose the buoyancy and pull the following stagnant slab. The pressures for the pulled following slab might increase and lead to transition, which could make chain reaction and induce collapse of the stagnant slab. The collapse scenario used for the explanation in the movie "Sinking Japan". If the collapse of stagnant slab has already started in 2009, East Japan Mega Earthquake could be explained as the result.

In this year, January 2, 2016, earthquake M5.7 with 681km of depth occurred in Vladivostok area. The depth 681km is determined with initial motion, however the depth with CMT was 641km and the focal mechanism was reverse fault type, common in stagnant slab above the lower mantle boundary. In the case of April 2009, the depths with initial motion and CMT were equal to 671km and in the Ogasawara 682/688km and 695/695km. Because the depth of January 2016 under 660km of initial motion indicates for the starting position of fracture and of CMT above 660km for the main portion of fracture, the earthquake occurred in the stagnant slab above the lower mantle boundary but started from pulled under the boundary by leading wedge of lower part of the slab for April 2009.

Chishima Slab has already earthquake M7.3 in August 14, 2012 with the depth of 654km just above lower mantle boundary. If Chishima slab is going to get into lower mantle, Pacific Plate would collapse with Chishima slab, Vladivo slab and Izu slab. Japanese Islands have been experienced

sinking of the area of present ebackbone range under the sea level in 10 Ma. We need to make up new earth science based on the geologic experiences of sinking.

Keywords: Pacific slab, stagnant,, , stagnant slab, lower mantle, phase transition, focal mechanism, sinking Japan

