

3-D display of subducting plates and plate activity using MR (Mixed Reality)

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Recent large quantity and high quality observation data such as those provided by the nationwide dense Kiban seismic and GPS networks have contributed considerably to deepen our understanding of 3-D inhomogeneous structure within the Earth, detailed structure of subducting plates, and phenomena occurring there such as earthquakes and magma activities. 3-D display of obtained results, such as detailed configuration of subducting plates or plate activity occurring there, is essential to be properly understood by other people, and even for ourselves it is very important to understand it more deeply. Moreover, this helps to spread scientific knowledge to the public.

Based on this idea, we have been trying to develop a method of 3-D display of those images. At JPGU2012, we showed 3-D images of the detailed view of two plates subducting immediately beneath Tokyo metropolitan area and of the distribution of earthquakes occurring in the area (Kaida et al., 2012). Also, we exhibited the display using the cutting-edge image technology (Mixed Reality; MR) at RCPEVE display booth at JPGU2012. MR is a technique which seamlessly merges real images and virtual CG images in real time; it is now gaining attention as an innovative image technology. By a head-mounted display, CG image is displayed as if it really exists in front of user. Since it detects the movement of the head-mounted display, the user can see the portions that are out of sight, such as the backside and underside of the target CG. This new system has allowed us to simulate observing phenomena of the Earth's interior with our own eyes.

With our previous contents, only space distribution display was available. However, now, we are working on the content production which enables us to see not only spatial variance but also time variation so that the spatiotemporal variation of seismic activities and crustal deformations can be displayed, through the use of AVS Express, which is a comprehensive and versatile data visualization tool, and MR system, the leading-edge image technology. In the present study, we will introduce the video contents which display the crustal deformations before and after the 2011 Tohoku-Oki earthquake observed by GPS and the interplate coupling and its co-seismic and post-seismic slips by the earthquake, along with the image of the Pacific plate subducting underneath northeastern Japan.

Keywords: 3-D display, Mixed Reality, subducting plate, plate activity, crustal deformation