Preliminary results from IODP Exp. 372 Creeping Gas Hydrate Slides and Hikurangi LWD

*Satoko Owari[1], Marta Torres[2], Paula Rose[3], Ingo Pecher[4], Philip Barnes[5], Leah LeVay[6], Joshu Mountjoy[5], Ann Cook[8], Michael Clennell[7], Greg Moore[22], Davide Gamboa[9], Brandon Dugan[10], Shuoshuo Han[11], Katja Heeschen[12], David McNamara[21], Matteo Paganoni[23], Angeliki Georgiopoulou[16], Elizabeth Screaton[24], Gaowei Hu[17], Gil Kim[18], Hiroaki Koge[19], Hung-Yu Wu[27], Judith Elger[15], Karina Machado[20], Michael Nole[11], Morgane Brunet[14], Sebastian Meneses[10], Sylvain Bourlange[13], Uma Shankar[25], Xiujuan Wang[26]

1. Chiba university, 2. Oregon State University, 3. Texas A&M University-Corpus Christi, 4. University of Auckland, 5. National Institute of Water and Atmospheric Research (NIWA), 6. Texas A&M University, 7. Commonwealth Scientific and Industrial Research Organisation(CSIRO), 8. Ohio State University, 9. British Geological Survey, 10. Colorado School of Mines, 11. University of Texas at Austin, 12. Geo Forschungs Zentrum Potsdam, 13. Universite de Lorraine, 14. University of Bremen, 15. GEOMAR, Research Center for Marine Geosciences, 16. University College Dublin, 17. Qingdao Institute of Marine Geology, 18. Korea Institute of Geoscience & Mineral (KIGAM), 19. University of Tokyo, 20. Federal University of Parana, 21. National University of Ireland, 22. University of Hawaii, 23. University of Oxford, 24. University of Florida, 25. Banaras Hindu University, 26. Chinese Academy of Sciences, 27. Japan Agency for Marine-Earth Science and Technology

International Ocean Discovery Program (IODP) Expedition 372 combined two research topics; active deformation of gas hydrate-bearing landslides and slow slip events (SSEs) in the Hikurangi Subduction Margin (HSM) off the east coast of the north island of New Zealand. According to previous studies, there is a thick landslide complex on the HSM called Tuaheni Landslide complex (TLC). The TLC has compressional features in the upper part of the slide mass however it shows extensional features in the lower part of slide mass. The extensional mass shows evidence for active, creeping deformation. Additionally, the transition depth between compressional and extensional deformation coincides with the pinch-out of the base of gas hydrate stability at the seafloor. Therefore gas hydrate itself may contribute to creeping of the TLC. The SSEs at the northern HSM are known as most well-studied and shallowest, recurring for two to three weeks about every two years and may extend close to the Hikurangi Trench. During the Exp.372 (conducted by R/V JOIDES Resolution, 26 November 2017 to 4 January 2018), we logged and cored from the seafloor to below the base of gas hydrate stability at one site (U1517) within the TLC. We also performed logging while drilling (LWD) into the upper plate, frontal thrust, and subduction section at three sites (U1518, U1519, U1520) in the Hikurangi trench to provide baseline logging data for IODP Exp.375.
Exp.375 will core these sites and an additional seamount site on the subducting plate, and will install borehole observatories.
At Site U1517, we recovered sediment with some pore-filling gas hydrate layers. Gas hydrate-bearing sediments were identified as cold spots using an infrared (IR) camera before core sectioning on the catwalk soon after core recovery because the dissociation of gas hydrate is endothermic reaction. After IR camera observation, whole-round cores were sub-sampled on the catwalk and samples were squeezed for onboard interstitial water analyses; titration for chlorinity and alkalinity, ion chromatography for anions and cations, spectrophotometry for silica, ammonium and phosphate and ICP-OES for major and minor elements. The dissociation of gas hydrate liberates freshwater and dilutes interstitial water thus chlorinity analysis is useful for estimating gas hydrate saturation in pore space. Gas hydrate saturation ranges between 2 and 68% at 130 to 170mbsf based on chlorinity analyses at U1517. Post-expedition analyses will provide additional data to gain further insight into the linkage between landslide complex and gas

hydrates in the HSM.

Keywords: Gas hydrate, Creeping, Tuaheni Landslide Complex, Hikurangi Subduction Margin, Inorganic Geochemistry, Interstitial water

