Pacific Array 2017

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-a report intended for the ION business meeting @ AGU2017-

This short report updates the current status of the Pacific Array initiative[1].

We are pleased to report that the first Pacific Array deployment will take place in spring of 2018 by the US team led by J. Gaherty (LDEO, Columbia University) via funding provided by NSF for a proposal "***Collaborative Research: Imaging small-scale convection and structure of the mantle in the south Pacific: a US contribution to international collaboration PacificArray***"[2]. This is the first funded deployment of the Pacific Array initiative that aims for two arrays (US1a and US1b in Figure 1). Proposals submitted in 2016 by Japan (deployment) and Korea (cruise) were not funded. The Japanese team led by H. Utada (ERI, U-Tokyo) has just submitted a renewed proposal to JSPS as an international collaboration with Korea and Taiwan for two arrays "Oldest" and "WPH" in the figure. The Korean team led by S.-M. Lee (Seoul National University) will submit a renewed proposal for cruises using the Korean ship. The Taiwan team led by P. Lin (TORI: Taiwan Ocean Research Institute) plans to submit a proposal to conduct an BBOBS array deployment in the Philippine Sea (WPH) to which the Japanese team will provide OBEM sensors.

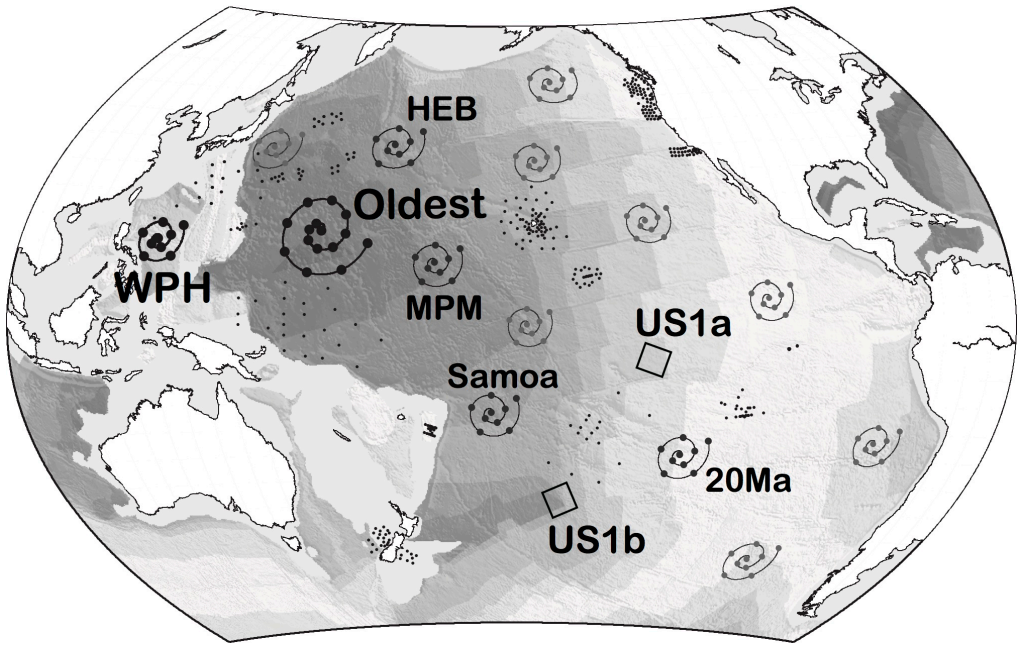

Fig. 1. Planned arrays of Pacific Array. Two arrays US1a and US1b are funded by NSF. Oldest and WPH arrays have been proposed by Japanese to JSPS. Small dots are past BBOBS deployments conducted either by Japanese or US scientists. Other named and un-named spirals denote possible arrays that are not more than *just-an-idea*.

Besides these planning activities, two international workshops for Pacific Array are held in 2017 in Seoul and Tokyo. The first one is held in the Seoul National University (SNU) in April 13-14 entitled "***Collaborative research in global ocean and subduction -toward Pacific Array-***"[3] (funding from NRF for YoungHee Kim (SNU) and from JSPS for H Kawakatsu (ERI)) in which 10 Japanese scientists visited SNU to discuss with Korean scientists and students/postdocs on the related matters. Also P. Lin from Taiwan (TORI) participated the workshop to discuss future collaborations. The second workshop is held in Earthquake Research Institute (ERI) of The University of Tokyo on May 23 after the JpGU-AGU joint meeting 2017. The title is "***Ocean Mantle Dynamics via Pacific Array***"[4] and various scientific problems related to the lithosphere-asthenosphere system beneath the ocean were discussed.

In addition, a review paper (Kawakatsu and Utada[5], 2017, ***Annual Review EPS***) that explicitly discusses about Pacific Array is also published in September, 2017 (written in July, 2016), in which the necessity and scientific merit are discussed. In the opening plenary session of the IASPEI meeting in Kobe, B. Romanowicz, in her keynote presentation, addressed the importance of the PA initiative. At the IRIS's 2017 OBS Symposium[6] held in Portland, Maine, Pacific Array was discussed in association with the long-term seafloor seismographs (LTSS) strategy by Monica Kohler (chair of the working group of LTSS).

So, overall, the Pacific Array initiative is moving forward and internationally well-received. Further successful funding for individual proposals, as well as new array proposals, are keenly awaited.

References:

[1]Pacific Array web: http://eri-ndc.eri.u-tokyo.ac.jp/PacificArray/

[2]National Science Foundation web: https://www.nsf.gov/awardsearch/showAward?AWD_ID=1658491&HistoricalAwards=false

[3]Workshop poster: http://eri-ndc.eri.u-tokyo.ac.jp/PacificArray/data/poster.pdf

[4]Workshop web: http://eri-ndc.eri.u-tokyo.ac.jp/PacificArray/postJpGUws2017.html

[5]Kawakatsu, H., and H. Utada (2017), Seismic and Electrical Signatures of the Lithosphere-Asthenosphere System of the Normal Oceanic Mantle, ***Annu. Rev. Earth Planet. Sci.***, 45, 139-167.

[6]Workshop web: http://www.obsip.org/about/2017-obs-symposium/

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- EU	***J.-P. Montagner (IPGP)***
- Australia	***B. Kennett (ANU)***
- S. Korea	***S.-M. Lee (SNU)***
- Taiwan	***P-Y. P. Lin (TORI)***

US team funded project:

Collaborative Research: Imaging small-scale convection and structure of the mantle in the south Pacific: a US contribution to international collaboration PacificArray (PI: Jim Gaherty)

All deformation on the surface of Earth, including faulting responsible for earthquakes, is produced by the motion of tectonic plates. It is widely accepted that thermal convection in the mantle drives plate motion, but details of that convection and how exactly it moves the plates are poorly understood. Oceanic plates make up 70% of the Earth's surface and offer important windows into mantle convection, yet they are largely unexplored due to the lack of seismic data from the ocean basins. Questions abound regarding the thermal structure of oceanic plates, the significance of volcanism in the middle of oceanic plates, and how the convecting mantle beneath the plates controls their movements. Waves in the gravity field and un-explained shallowing of the ocean floors hint at small-scale convection beneath the oceanic plates. This project contributes to an international effort to strategically place temporary arrays of instruments across the Pacific Ocean basin that record the energy from earthquakes. Recent community advances in ocean bottom seismographs will be used to record unique datasets in locations where large gaps in coverage exist today. These data will allow us to infer deformation and variations in mantle temperature related to small-scale convection. As part of the international collaboration, all data will be openly available to scientists worldwide. The project supports the training of graduate and undergraduate students.

This project will collect 12-15 months of broadband ocean bottom seismograph (OBS) data in two 30-station arrays in the central and southern Pacific. These arrays, deployed at two distinct plate ages (~30 Ma and ~120 Ma), will address specific critical questions on the dynamics of the oceanic asthenosphere, including its underlying state (temperature, presence of melt, water or other volatiles, and deformation mechanism). The arrays are designed to image the anisotropic velocity signature of small-scale convection, which has been invoked to explain the flattening of the age versus depth curve in old ocean plates, 140-200 km wavelength gravity lineations, and ubiquitous off-axis, non-plume volcanism observed at a variety of scales. Anisotropic surface wave and body wave tomographic models will be supplemented by shear wave splitting and attenuation measurements to obtain a multi-faceted understanding of the asthenosphere and base of the plates. Finally, the order-of-magnitude increases in path coverage for surface and body waves in the south-central Pacific will enable new advances in global tomography.