Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)
©2015. Japan Geoscience Union. All Rights Reserved.

SIT36-07 Room:102A Time:May 25 10:30-10:45

Integrated Frequency Comb Spectroscopy by ACROSS: Active Monitoring by Use of Elastic and Electromagnetic Waves

KUMAZAWA, Mineo[1*] ; HIGASHIHARA, Hiromicho[2] ; FUJII, Naoyuki[3] ; KUNITOMO, Takahiro[4] ; TAKEUCHI, Nozomu[2] ; OGAWA, Yasuo[5] ; OTANI, Takahiro[4]

[1]ELSI, TiTec, [2]ERI, Univ. Tokyoo, [3]CIRENH, Shizuoka Univ., [4]Nagoya University, [5]KSVO, TiTec

In 1994, we started to develop an active method of observing the Earth's interiors by means of stationary transmission of accurate sinusoidal signal of elastic and electromagnetic waves. Original idea was quite naive in a sense that signal is a sinusoid with one spectral line, whereas we were confident that this type of frequency domain approach is definitely promising in future on the basis of its principle itself. Later developmental works made by many colleagues have been made to introduce a variety of new ideas, new theories and new technologies both in hardware and supporting theory. Koshun Yamaoka, Junzo Kasahara and their colleagues have been accumulating a large amount of applications. Now we are confident that this frequency domain approach is essential after 20 year effort on the developmental works for this methodology.

Now we claim that a new era has come to study the physics of the whole Earth's interiors by using an active method of physics instead of passive phenomenological approach. Pressure and temperature range of laboratory experiments on the materials has been extended to the bottom of the mantle, the first principle computation of physical properties has been realized, and numerical simulations of a variety of dynamic processes have come to be made, whereas the observation on the real nature has been made only passively so far without sufficient resolution and reliability yet.

We have apparently two major targets of the new observation technology:

(1) Active observation of the whole mantle, the inner core and also their boundary layers to provide much reliable data on the structure and their temporal variation with higher resolution to study the dynamics of the whole Earth. This target demands the installation of powerful transmitters distributed over the different continents, so that international corporation is demanded.

(2) Qualified system for monitoring the volcanic and earthquake fields can be now designed and proposed: implementation of denser array of both electromagnetic and elastic ACROSS of wider frequency range to acquire the detail physical states at the target sites. Special emphasis is placed on the physical studies of anisotropy and other structure-sensitive properties of the materials. The primary importance is to be placed on the study of the material physics through the qualified observations combined with laboratory experiments and material physics, which are essential for the background of future prediction research works on the disastrous events.

This presentation is an introduction to the forthcoming works directed to the "Integrated Frequency Comb Spectroscopy by ACROSS" for geophysical researches.

Keywords: ACROSS, frequency comb, monitoring observation, whole Earth