Dr. Steeve Gréaux
Assistant Professor
Geodynamics Research Center

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Venue: Meeting Room #486

Science Research Bldg. 1, 4th floor.
Ehime Univ.

Keywords:
1. Gold
2. Elastic wave velocities
3. Pressure scale

Toward an internally consistent pressure scale for Gold based on sound velocity measurements at high-pressure and high-temperature.

Because of its remarkable properties, gold has been a primary choice as pressure calibrant for static compression experiments. Consequently, tremendous efforts have been made to construct a reliable P-V-T equation of state (EoS) for gold, on the basis of static compression data, elastic and shock wave measurements or computational techniques. Despite such effort, there are still disagreements between the various EoS of gold found in the literature, which results in substantial inconsistencies between high-P experiments when a different EoS is employed. While it is difficult to explain the reasons for the discrepancies between previous studies, EoSs of gold have a common denominator, which is they all rely on external pressure scales and elastic parameters from different studies.

Here we measured P- and S-wave velocities (V_P and V_S) of gold up to 22 GPa and 1300 K by means of ultrasonic interferometry and synchrotron X-ray diffraction and imaging techniques in the multi-anvil press at the beamline BL04B1 in SPring-8. The experimental data were used to constrain the pressure and temperature dependences of V_P, V_S and density of gold. A fitting of our experimental dataset to a third order finite strain EoS yielded new constraints on the elastic properties of gold, which were used to calculate pressure independently from any other external pressure scale. The new P–V–T datasets were used to construct an internally consistent thermal EoS for gold.

Contact: Steeve Gréaux, PhD. (e-mail: greaux.steeve_georgi.me@ehime-u.ac.jp)