

## Tracking dynamical phenomena with X-ray free-electron lasers

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X-ray free-electron lasers (XFELs) provide brilliant X-ray pulses with femtosecond duration and are utilized to track dynamics, which is difficult to capture using synchrotron radiation. In the femtosecond time domain, one can achieve "molecular movie"<sup>1-3</sup> with an atomic spatio-temporal resolution by combining XFEL and synchronized optical laser pulses. On the other hand, in the nanosecond time domain, XFELs are utilized to observe irreversible dynamic processes<sup>4,5</sup> with the single-shot measurement scheme that can not be performed with synchrotron radiation.

In this presentation, I will talk XFEL properties and research examples at SACLA to discuss the XFEL potentials in Earth and planetary science.

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