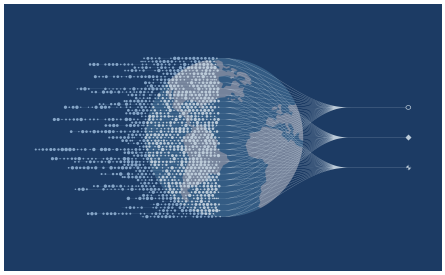

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Time residuals at HA11 and HA3 for T-phases from deep earthquakes in the Ring of Fire

Friday 12 September 2025 12:00 (1 hour)

This work investigates the T-phase time residuals (defined as differences between the observed arrival times and their theoretical values) at IMS hydrophone stations HA11 and HA3 in the Pacific Ocean. The work is focused on T-phases from earthquakes in the Ring of Fire recorded between 2001 and 2024. Time residuals of T phases from these regions can typically range from minus 150 to 150 seconds. These disparities between expected and observed arrival times can present significant challenges when associating hydroacoustic signals to events built by automatic processing systems or by human analysts based on signals recorded by the IMS network. In this work, we shed light on the reasons for these high time-residual variabilities. We show that the time residuals in these regions depend on the location of the hypocentre along the subduction plate. Overall, time residuals go from negative (T phases arrive earlier than expected) to positive (later than expected) as the earthquake depth decreases along the subduction and approaches the Ocean Trench. We present general results for the Ring of Fire and detailed analyses for regions with different subduction angles in the trenches of Kermadec-Tonga, Mariana, Philippines, Nansei-Shoto, Kuril, Aleutian and Peru-Chile.

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