Fluid flow along faults in subduction zones : direct insight from seafloor deep-drilling

Mai Linh Doan*†[1], Pei Pei[2], and Joshua Pwavodi[3]

[1]Institut des Sciences de la Terre – Institut de Recherche pour le Développement, Institut National des Sciences de l'Univers, Université Savoie Mont Blanc, Centre National de la Recherche Scientifique, Université Gustave Eiffel, observatoire des sciences de l'univers de Grenoble, Université Grenoble Alpes – France

[2]Institut des Sciences de la Terre – Université Grenoble Alpes – France

[3]Bureau de Recherches Géologiques et Minières – Bureau de Recherches Géologiques et Minières (BRGM) – France

Résumé

Subduction zones are the loci of large subduction earthquakes that might extend to the seafloor, creating devastating tsunamis. Understanding the localization of deformation and the structuration of the shallow subduction is essential to understand the dynamics of tsunamigenic earthquakes.

In the last two decades, plate boundary fault zones of subduction zones have been drilled within the framework of the International Ocean Discovery Program (IODP). At the same time, drilling technology was revolutionized by the introduction of Logging While Drilling tools. These tools provide real-time measurements before a formation gets disturbed by further drilling. Pwavodi and Doan (2024) developed a new methodology to identify the inflow from the formation to the borehole and derive a continuous hydraulic profile along the well.

This methodology has been used in several wells of the Nankai and Tohoku subduction zones. This provides insights into the diversity and time evolution of the hydraulic structures of these subduction zones, in association with megathrust earthquakes and slow slip.

Mots-Clés: Fault hydrology, subduction zone, Drilling, IODP

*Intervenant

†Auteur correspondant: Mai-Linh.Doan@univ-grenoble-alpes.fr