Abstract: Enhancing multidisciplinary monitoring through national and international cooperation in Costa Rica. Case study at Poás and Rincón de la Vieja volcanoes.

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Costa Rica hosts two hot and hyperacid crater lakes at the Rincón de la Vieja and Poás volcanoes, both of which are currently active, with historic phreatomagmatic and magmatic activity. In the last decade, Rincón de la Vieja's largest phreatomagmatic eruptions occurred in June 2017, June 2021 and April 2023. Since 2011, 21 hot lahars have descended through the north flank of Rincón de la Vieja volcano; exceptional eruptions have caused small pyroclastic flows. Whereas at Poás, the most recent phreatic to magmatic eruption occurred in April 2017, followed by a period of phreatic activity in 2019, early 2024, and more recently, a phreatomagmatic episode in 2025. Poás 2017, 2024 and 2025 eruptions had important effects on the inhabitants, affecting economic activities (livestock, agriculture, tourism) and particularly people and animal´s health due to ash fall, gases and acid rain, mainly on the southwestern flank. The Observatorio Vulcanológico y Sismológico de Costa Rica at Universidad Nacional (OVSICORI-UNA) currently monitors ten potentially active volcanoes in Costa Rica. Multidisciplinary techniques in quasi-real time improve the tools for early detection of volcanic unrest or imminent eruptions. Collaboration between OVSICORI-UNA and national/international partners enhances the possibility of, and mechanisms for, early warning systems eruptions at Costan Rican volcanoes. Instituto Costarricense de Electricidad ICE, Red Sismológica Nacional RSN, Volcano Disaster Assistance Program (VDAP, USGS), AVERT (LDEO, Columbia U.), Université Libre de Bruxelles, have not only increased the instrumentation capabilities near active volcanoes, but have also contributed to the knowledge exchange and innovation in monitoring techniques in Costa Rica.