

# The importance of overbank deposits and paleosol analyses for comprehensive volcanic hazard evaluation: The case of Holocene volcanism at Miravalles Volcano, Costa Rica

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# Abstract

On the flanks of the dormant Miravalles volcano, systematic fieldwork and radiocarbon dating of buried humus-rich soils (paleosols) and wood fragments, augmented by mineralogical and geochemical analysis, reveal extensive and previously undocumented Holocene activity. Phase 1 consisted of 8.3 ka (~6300 BCE) volcanic debris avalanche and thick lapilli blast and fallout deposit that appear coeval. Hiatus 1 marks 2600 years of inactivity ensued followed by Phase 2 lapilli interbedded with ~5.5 ka lahars below a 5.3 ka basaltic lava flow (~3400 BCE). Hiatus 2 lasted 1800 years from 5.3 ka to 3.5 ka (3300-1500 BCE), after which a very active Phase 3 ensued (3.5 to 0.5 ka; 1600 BCE to 1500 CE) with > four lapilli eruptions, > 4 lahars, > 6 layers of ash and pumice, and small andesitic lava flows. The most recent evidence for eruption is an 880-year-old (0.9 ka; 1070 CE) lapilli overlain by gravels that may represent distal lahar sediments. Evidence indicates the occurrence of at least two, if not three, destructive lahars on the southwest flank of Miravalles in the past 500 years. The overbank sedimentary record indicates much more activity of Miravalles volcano over the past 3500 years (since 1500 BCE) than previously known, with a minimum of 24 events in that span. Overbank floodplain deposits are likely to contain the most complete record of recent activity in active and dormant volcanoes, and in the absence of dateable vegetation fragments, radiocarbon dating of paleosol A-horizons is very useful, with a precision of ~ 10%, i.e. 800 ± 80 ybp.

# Full Text

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