



Soil loss and resilience associated with end-Triassic deforestation

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Soils are a crucial link between the atmosphere, biosphere, and geosphere and disturbances to the health of soils will severely impact plants as well as a multitude of organisms living in or on soils. Catastrophic soil loss is thought to have played a pivotal role during mass-extinction events as a result of major deforestation, but the exact feedbacks remain elusive. Here, we assess the role of soil loss into the end-Triassic mass-extinction event based on proxy data obtained from core material from France, Germany, England, Denmark, and Sweden. Clay mineral and palynological data indicate a strong increase in chemical weathering and mechanical erosion during the latest Rhaetian with the influx of kaolinite and abundantly reworked Palaeozoic organic matter. Based on a new timeline, these changes were coeval with intense volcanic activity in the Central Atlantic Magmatic Province (CAMP), which released large quantities of volatiles that contributed directly and indirectly to enhanced weathering. Erosion rates likely also rose in response to deforestation, repeated forest fires, and seismic activity related to CAMP emplacement. Using a novel proxy based on biological degradation of fern spore walls, the intensity of biodegradation by fungi and bacteria, a process coupled to organic matter decay in soils, strongly decreased across the T/J boundary. We interpret this as evidence for the widespread removal of soils. Taken together, CAMP induced environmental changes led to profound changes in weathering and erosion and removal of soils, while soil resilience during the Hettangian proceeded hand in hand with recovery in Jurassic seas.