Atmospheric dust loading in eastern equatorial Pangea (Western Europe) and its impact on the Late Paleozoic climate system

Lily Pfeifer * [1], Tina Wu [2], Ying Cui [2], Jean Van Den Driessche, Pochat Stéphane [3], Jahandar Ramezani [4], Michael Soreghan [5], Gerilyn S. Soreghan [5]

[1] Rowan University, United States
[2] Montclair State University, United States
[3] Laboratoire de Planetologie et Géodynamiques, Nantes University, France
[4] Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, United States
[5] School of Geosciences, University of Oklahoma, United States

Permo-Carboniferous strata in the Lodève Basin (France) documented as paleo-loess deposits share characteristics analogous to correlative units in continental basins elsewhere in eastern equatorial Pangaea (Western Europe). Thick successions of massive red mudstone typically interpreted as playa lake or floodplain deposits document what may have been widespread semi-arid conditions in these low-latitude systems, and abundant atmospheric dust, perhaps generated in part in the glaciated alpine terranes of the low-latitude Variscan Belt. Volcanic dust (ash) sourced from contemporaneous explosive and abundant volcanism in Western Europe supplemented this non-volcanic dust flux and could have enhanced the nutrient reactivity of mineral dusts via acidic atmospheric processing. Dust loading was important in the late Paleozoic as continental environments aridified, but the impact of nutrient feedbacks on (marine) organic carbon burial and the reduction of pCO_2 is not well constrained. Using quantitative data from the Upper Paleozoic geological record (ie., eruptive recurrence interval, documented volcanic centers) and observed data from modern analogues (gas flux, nutrient load), preliminary results of sensitivity tests using an Earth system model (cGENIE) show that perhaps the impact of volcanic dust flux on biogeochemical cycling during this time was not as important as the fertilization effect caused by non-volcanic mineral dust and/or the elevated iron solubility of atmospheric aerosols (in a volcanically-influenced acidic atmosphere).