

VOLATILE EMISSIONS FROM CENTRAL ATLANTIC MAGMATIC PROVINCE BASALTS: MASS ASSUMPTIONS AND CONSEQUENCES

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Mesozoic basins that preserve extrusive basalts of the 200 Ma Central Atlantic Magmatic Province (CAMP) may total about 300,000 km². However, dikes and sills of CAMP that fed the basin basalts are spread across an area greater than 10 million km² within four continents. In addition, basalts of the East Coast margin igneous province (ECMIP) of North America, which cause the East Coast Magnetic Anomaly, covered about 60,000 km² with perhaps 1.3 million km³ of extrusive lavas. If only half of the continental CAMP area was originally covered by 200 m of lava, the total volume of CAMP and ECMIP basalt exceeds 2.3 million km³ and may be the largest known sub-aerial flood basalt event.

Averages of volatile contents of eastern North American CAMP tholeiitic dikes and sills, in weight %, are: CO₂ = 0.066; S = 0.046; F = 0.032; and Cl = 0.064. Atmospheric emissions of volatiles from extrusive basalts can be reasonably estimated as half of the volatile content of the comagmatic intrusive basalts, mainly as gaseous plumes from lava curtains at the erupting fissures. Volcanic emissions of these gases therefore ranged between 1.13 x 10¹² and 2.33 x 10¹² metric tons, enough for major world-wide environmental problems. Climatic effects could include both immediate cooling from S converted to sulfuric acid haze, and a longer period of greenhouse effects from the CO₂. Radiometric and stratigraphic ages indicate most of the magmatic activity was brief, widespread, and close to the Tr-J boundary, which is marked by a profound mass extinction. A causal connection between these great volatile emissions and the mass extinction has not been demonstrated within Mesozoic basins, so it may depend upon how precisely radiometric dates for the basalts bracket the Tr-J boundary.