



Alpine lake optical properties as sentinels of dust deposition and global change

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ABSTRACT: We characterized dissolved organic matter in La Caldera, an alpine lake in Sierra Nevada (Spain), and watersoluble organic compounds (WSOC) in dry and wet deposition originating from Saharan and marine air masses using ultraviolet-visible absorbance and three-dimensional fluorescence spectroscopy. Molar absorption coefficients at 250 and 280 nm in the lake were highly correlated with those in organic aerosol deposition, originating mainly from Saharan dust, and suggest that absorption in clear alpine lakes in unvegetated catchments may represent a unique sentinel of desertification and global change. Using parallel factor analysis modeling to resolve dominant fluorescent components, we identified a semiquinone-like fluorophore (C9) in the WSOC of deposition that was traced into the lake. At least three fluorescent components, including C9, contributed significantly to absorption of WSOC from atmospheric deposition. Saharan dust supplied chromophoric, aromatic, and fluorescent organic matter to this alpine lake. In contrast, marine organic aerosols had lower absorption coefficients, lower fluorescence intensity, and more microbial fluorescence properties.

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