3.121 Effects of African dust in the nutrient, radiation, and water budget of a tropical forest.

Early Career Scientist

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Abstract:

African dust travels thousands of kilometers and can reach the Americas and the Caribbean. Dust particles interact with radiation, by directly scattering and absorbing it, or indirectly by serving as cloud condensation nuclei (CCN) or ice nuclei (IN). These particles can also affect the water budget by altering the normal precipitation patterns of an ecosystem. Through dry and wet deposition, they can alter the nutrient budget of a system. As part of the Luquillo Critical Zone Observatory, field campaigns were held during the summers 2013, 2014, and 2015 at Pico del Este, a tropical montane cloud forest in the Caribbean island of Puerto Rico. Cloud microphysical properties, which include liquid water content, droplet concentration, and droplet size, were measured. Cloud and rainwater samples were collected and analyzed for chemical composition. Properties analyzed include pH, conductivity, the concentration of ions and trace metals, and concentration of total and dissolved organic carbon and nitrogen. Radiation, visibility, precipitation (total and intensity) and meteorological state variables (temperature, relative humidity, wind direction and wind speed) were also measured at this station. Samples were separated between high and low dust concentration samples using products from models and satellites. Results suggest that some African dust serves as a CCN, increasing by 44% the droplet concentration and by 33% the liquid water content under high dust events, which could be affecting the radiation and water budgets. Chemical analyses showed an overall increase in the concentration of ions, trace metals, and total and dissolved organic carbon and nitrogen under high dust influence (e.g., Ca trace metal in cloud water was 4x higher). An increase in the concentration of ions and trace metals could alter the nutrient budget of the ecosystem by injecting nutrients like nitrogen, phosphorous and calcium into the ecosystem.