Fog chemistry in southeast Tibet forest ecosystem

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Fog plays an important role in hydrate and nutrient cycle in high attitude forest ecosystems. In southeast Tibet, it is well known that net productivity and carbon sequestration in native forest ecosystems was the highest all around the world. Due to high humidity and large temperature difference between day and night, fog events could be observed frequently in those areas, especially occurred in plant growing season. But fog chemistry has never been reported. Here, we collected fog water samples by Caltech Active Strand Cloudwater Collector (CASCC) at National Forest Ecosystem Observation & Research Station of Tibet Linzhi (29.65N, 94.72E, 3950m, a.s.l.) and determinated cations and anions in 2017 and 2018, meanwhile, rain water samples were collected by rain gauge and analyzed at the same time. The mean concentrations of NH4+, SO42-, K+, Ca2+, Cl-, NO$_3$- , Mg2+, Na+ were 32.9, 50.0, 29.4, 232.5, 75.8, 20.6, 38.0 and 75.2μeq L-1 in fog water, correspondingly, those values were 7.1, 19.4, 13.1, 122.7, 40.1, 13.9, 28.7 and 58.5μeq L-1 in rain water. Obviously, all ion concentrations in fog water were higher than those in rain water, ignoring fog deposition might lead to an underestimate of total flux, especially for ammonia (4.6 times) and sulfate (2.6 times). Genarally speaking, pH value in the fog was much lower than that in rain water, but minor difference was found in our reasearch (6.38 and 6.21); one explaination was that H+ reacted with NH3 to form NH4+ in fog water, additionally, high NH4+ concentraitons was founded in fog water. Pearson correlation analysis indicated that all ions was significant correlate to Na+ concentrations in fog water, means marine sources contribute largely to local fog ions; 72 hour back-trajectory analysis confirmed that airmass during fog or rain events arrived mainly from the south direction also; it should be point out, High Ca2+ concentration in both rain water and fog water could be explained by that dust pollution derived from the national highway 318. In conclusion, our finding suggested that fog water could be a vital nutrient input to southeast forest ecosystem beside precipitation deposition.