

# **Forests fed by cities: Burning of biomass as a source of nitrogen for the soils through fog deposition in southern Chile**

Iván Felipe Benavides - Carlos Oyarzún - Diego Vargas

Laboratorio de Sedimentología e Hidrología – Universidad Austral de Chile

## **Abstract**

The city of Valdivia in southern Chile burns 350.000 tons of biomass for heating during the Austral winter (June-September). During this season the city and surrounding native forests are covered with dense fogs that mixes with the smoke to produce “superfogs”. Because ammonium and nitrate are the main ions coming from biomass burning and can be easily attached (N enrichment) to water molecules in fog water, we hypothesized that these processes can generate important incomes of N for the forests. We determined the effect of Valdivia as source of N for the soils of native forests in the Llancahue reserve, 7 km southeastwards from Valdivia. We collected water from 13 superfog events in Valdivia, Llancahue and Oncol, this last being outside the effect of the city (comparison reference). We also extracted the water contained in the superficial soils (0-20 cm depth) of Llancahue after each event. The water samples were analyzed for  $\text{NH}_4$  and  $\text{NO}_3$  concentrations and their isotopic signatures of  $^2\text{H}$  and  $^{18}\text{O}$  to identify their geographic origin and source. The main results were: 1) enrichment of fogs in Valdivia and Llancahue; 2) Valdivia as the geographic origin of the fogs that reach Llancahue after N enrichment and 3) evidence of fog dripping from canopies to soils in Llancahue during the longer events, suggesting that enriched fog water could be available in the soils for shallow rooted plants. Preliminary conclusions points that cities in southern Chile could be important sources of N for forests trough fog enrichment and deposition.

**Key words:** Superfog, soils, forests, ammonium, nitrate, biomass burning, stable isotopes