Geophysical Research Abstracts
Vol. 17, EGU2015-15811, 2015
EGU General Assembly 2015

Megacity Levels of Black and Brown Carbon in the Port of Valparaiso, Chile: A Toxic Mix of Bus, Truck, Ship, Industrial and Wood Burning Emissions

Julio Marin (1), Graciela Raga (2), Darrel Baumgardner (3), Ana Cordova (1), Jorge Arevalo (1), and Diana Pozo (1)

(1) Departamento de Meteorología, Universidad de Valparaíso, Chile, (2) Centro de Ciencias de la Atmósfera, Universidad Nacional Autónoma de México, DF, México, (3) Droplet Measurement Technologies, Boulder, CO, USA

Measurements of effective black carbon (eBC) have been made during three seasons (Winter, Spring and Summer) in Valparaiso, a coastal city that is located in the subtropics and is the largest commercial port in Chile. In addition to the ships in the harbor and the trucks that service the shipping industry, the primary public transport in the city is a bus system that uses diesel as its primary fuel source. Adding to the emissions of black and brown carbon (BC, BrC) from mobile sources is an oil refinery approximately 30 km to the north and in the winter many residences use wood burning as a primary source of heating. In winter the wind speeds are low, the boundary layer is shallow and there are frequent night time thermal inversions. The meteorology, coupled with a topography of very steep hillsides surrounding the bay, leads to episodes when the maximum eBC, measured with filter-based and photoacoustic techniques, often exceeds 10 μg m-3 and average mass concentrations are > 1.0 μg m-3. The absorption angstrom exponent (AAE), derived from measurements of the absorption coefficient at 550 nm and 870 nm, provides an indicator of the source of the eBC and brown carbon (BrC). The AAE ranges from 0 – 4, the lowest values, <1, associated with diesel emissions from public transport and the highest values, >3, with biomass combustion. The values in the mid-range appear to be associated with ship emissions or from the oil refinery. Removal of these aerosol particles is linked to the sea/land breeze circulations and periods of heavy fog and drizzle.