

Fate of pollutants in the arctic

Over the last decades there has been an increasing awareness of pollutants advected into the arctic from source areas over the surrounding continents. Pollutants in the arctic result in an array of problems ranging from arctic haze, acidification and eutrophication as well as accumulation of toxic substances. Several semi volatile substances as mercury, PCB and POP (persistent organic pollutants) will be in the condensed phase in the cold arctic climate, subsequently accumulating to levels unprecedented in background areas at lower latitudes.

Pollutants over densely populated areas as North America and East Asia are to a large extent lifted into the free troposphere by convective processes. Compared to other source regions the main European sources are in general located at higher latitudes where convection is less active, and thus pollutants to a much larger extent remain in the boundary layer. Combined with Europe's proximity to the polar region compared to other major source regions, the result is that a large portion of the environmental problems encountered in the arctic can be attributed to European emissions.

In the Arctic the residence time of in particular sulphur and nitrogen species may be considerably longer than at lower latitudes. In the winter low temperatures and lack of sunlight brings the chemical activity almost to a standstill. A large portion of the nitrogen will be in the form of reservoir species like PAN or PAN-like substances. As air masses are advected south the remaining pollutants will act as an additional source at mid latitudes.

It is recognized that advection pathways and processes affecting pollutant levels in the Arctic can be strongly affected by climate variability.

Within the framework of a polar year research should be carried out studying the advection of pollutants into the Arctic, and their chemical and physical processing. Furthermore the effect of remaining pollutants re-entering the mid latitudes should also be studied. Such a study should include multi-annual model and observational data in order to identify effects of climate variability and emission changes on the polar environment.