



The role of emission background on fog chemistry at some selected mountain tops in Poland

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Sudety Mountains and Western Carpathians form significant orographic thresholds and airflow deformation as a consequence. Fog deposition play a dominant role within the structure of the wet deposition. Intensive development of power industry in surroundings of the mountains resulted in catastrophic ecological disaster in forest ecosystems, which became clearly visible since 1978. Air pollution concentration in Western Sudetes between 1979 and 1982 achieved the highest level ever measured in Europe and pH values of fog and precipitation below 3,8 were observed frequently. Due to this situation only in Polish part of Sudety Mountains over 13500 ha of forest have been destroyed and 92,7% of remaining conifers was classified as partially damaged. Currently pollutants emission decreases, none the less still acquires high level and cumulated effect on soil and trees reacts. Since the beginning of XXI century forest disaster proceeds in the Western Carpathians and the territorial range of disaster still continous to expand.

The main goal of the project was to compare chemical structure of fog from different mountainous locations in the context of emission background and different circulation directions. There were 3 measurement points installed for collecting daily samples of fog deposition from February 2009 to January 2010. Each point has been located on the top of the mountain on the altitude range between 1200 and 1400 m a.s.l., as well as selected as a representative for wider mountainous area: Mt. Szrenica (Western Sudety Mountains), Mt. Śnieżnik (Eastern Sudety Mountains), Mt. Skrzyczne (Western Carpathians). They form horizontal profile from Northwest do Southeast with the lenght about 300 kilometres. Solid and liquid samples of fog were collected daily using passive fog collectors.

It was established that the efficiency of fog precipitation decreases significantly from the Western Sudety Mts to the east. Solid fog deposit amounts 4 times higher volume of water at the Mt. Szrenica when compare with the Mt. Śnieżnik (Eastern Sudety Mts). It is due to much better exposure of Mt. Szrenica for maritime air masses coming from the SW-W-NW sector. Farther to the east fog deposition efficiency slightly increases and at the Mt. Skrzyczne amounts to 30% of the Mt. Szrenica value. Mt Skrzyczne is surrounded from the west to the north by deep terrain depressions, which separates the Bohemian Massif (with the Sudety Mts) from the Western Carpathians. Efficiency of the liquid fog deposition was similar in proportion: 40% at the Mt Śnieżnik and 60% at the Mt. Skrzyczne, respectively.

Chemical compounds were determined for 700 fog samples. Weighted mean of pH values changed from 4,21 at the Mt. Szrenica to 4,90 at the Mt. Skrzyczne. The most important ions, within the structure of the fog water, were the following: SO₄²⁻ at the Mt. Śnieżnik (over 0,080 meq/l) and NO₃⁻ at the Mt. Szrenica (over 0,070 meq/l).

There were also taken dendrochronological samples from the stems of upper spruce to find relations between air pollution concentration and spruce vitality, visible in the size of annual tree rings. Period of reduced vitality in the eighties of the XX century and increasing of the tree's condition in next decade is clearly visible.