



Lead Author e-mail: [piotr.muskala@uni.wroc.pl](mailto:piotr.muskala@uni.wroc.pl)

**Title:** *Foehn effects typology for West Spitsbergen*

**Piotr Muskala**<sup>1</sup>, Krzysztof Migala<sup>1</sup>, Jacek Piasecki<sup>1</sup>

<sup>1</sup>*University of Wrocław, Department of Climatology and Atmosphere Protection*

Various relief of West Spitsbergen together with frequent occurrence of dynamic synoptic situations makes it a favourable location for foehn-type disruptions in mesoscale airflow over the island. Long term and seasonal meteorological observations in Polish Polar Station (Hornsund) and Stanisław Baranowski Spitsbergen Polar Station showed relatively frequent occurrence of foehn effects and their important role among processes responsible for great topoclimatic variation of the region. Recent extensive research material collected with use of automatic weather stations located densely in the surroundings of Polish Polar Station and automatic sky lapse camera allowed to undertake detailed studies on the essence of the foehn process, as well as its connections with atmospheric circulation in regional scale. The research material contained as well manual measurements data, archive data, air temperature in different isobaric levels reanalysis and information about atmospheric circulation types. Analysis of this data allowed to propose a detailed classification of foehn-type effects in context of atmospheric circulation in the study area, that develops and proofs the ideas known from earlier studies.

Foehn effects may occur in various synoptic situations and weather conditions:

- 1) advective foehn driven by airflow in peripheral areas of anticyclones
- 2) foehn of subsiding air mass
- 3) mesoscale cyclonic/anticyclonic foehn
- 4) local orographic foehn

Foehn-type processes in West Spitsbergen occur within airflow from E to S, due to topography. Occurrence of specific sequence of synoptic may set a full cycle of orographic-advective mesoscale foehn process which consists of five phases:

- 1) orographic-dynamic cyclonic mesoscale foehn (SEc)
- 2) orographic-dynamic anticyclonic mesoscale foehn (SEa)
- 3) macroscale advective foehn (Ka, upper advection of Polar continental air mass)



4) stable air mass subsidence (Ka)

5) disappearance of foehn-type circulation and development of local breeze

Additionally frequently occurring “quasi-foehn” effect was precisely described as existence of orographic foehn clouds over a mountain range without significant thermodynamic effects in lee, characteristic for foehn (air temperature and wind speed increase, air humidity decrease). Existence of quasi-foehn effect in the study area may first of all result from various land cover, especially the presence of glaciers. This completes the proposed classification of foehn-type effects in SW Spitsbergen.