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Surface energy fluxes over wind disaster area

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Objective of this study was to identify and quantify the effect of land surface changes on heat and water vapour fluxes over a wind disaster area in High Tatra Mts. (Slovak Republic). About 12,000 ha of the closed forest stand was destroyed during a windstorm with devastating effects in this region.

The heat and water vapour fluxes were determined for three experimental sites within the wind disaster area using the Bowen ratio method and they were compared with corresponding data relating to a reference site. The surface resistance for the water vapour transfer was estimated using the inverted Penman-Monteith equation.

Simultaneously, a SVAT model simulating the heat and water vapour fluxes over the surveyed area has been designed and experimentally tested. The model provided a possibility to separate partial effects of atmospheric and land surface factors on the energy fluxes in the surface layer of the atmosphere. Testing the model sensitivity to input data, the response of surface fluxes to changes in soil and vegetation characteristics were analyzed over the affected area.

The obtained results led to conclusions that dramatic changes in the surface characteristics, caused as a result of the exceptionally strong wind, significantly influenced the heat and water vapour exchange between the land surface and atmosphere over the affected area. The high variability in aerodynamic and surface resistances was recorded as well. It was shown that the surface resistance for the water vapour transfer over the disaster area has changed as a result of alterations in plant characteristics as the leaf area index, root system development, or the response of stomata to changes in soil

moisture and atmospheric factors.