P1.25 THE SKUR EXPERIMENT: OBSERVED PRECIPITATION PATTERNS AND AMBIENT FLOW IN A MESOSCALE MOUNTAIN RANGE

Haraldur Ólafsson[1], Þórður Arason[2], Hálfdán Ágústsson[3], Sveinn Brynjólfsson[4] and Ólafur Rögnvaldsson[5]

[1]University of Iceland, Bergen School of Meteorology, Geophysical Institute, University of Bergen and the Icelandic Meteorological Office (haraldur68@gmail.com)
[2]Icelandic Meteorological Office
[3]Institute for Meteorological Research and University of Iceland
[4]Icelandic Meteorological Office and University of Iceland
[5]Institute for Meteorological Research and University of Bergen

1. INTRODUCTION

During the summer of 2007, precipitation was observed with a network of 40 automatic raingauges in the Reykjanes mountain range in SW-Iceland (Figs. 1 and 2). This region is known to have very strong and variable precipitation gradients (de Vries and Ólafsson, 2003; Rögnvaldsson et al., 2007) and it is of academic and practical interest to explore the precipitation pattern in this region. This paper presents some key results from this experiment named SKUR.

2. RESULTS

Figure 3 shows the accumulated precipitation during the whole experiment. Maximum precipitation is found immediately downstream of the mountain crest and it is about 6 times greater than the upstream precipitation.

Figures 4 and 5 show cases of large orographic enhancement of the precipitation. In the Fig. 4 case, the winds are strong and perpendicular to the mountain. There is no directional windshear. Here, the maximum precipitation is downstream of the crest and there is considerable spillover far downstream. In the Fig. 5 case, the low level winds are on the other hand quite weak. Here, the maximum precipiatation is upstream of the crest and there is effective drying downstream. Because of the weak low level winds, there is presumably a low level blocking in front of the mountain range, acting as an extension of the mountains. The Fig. 6 case is remarkably similar to the Fig. 5 case. Both have similar precipitation distributions and very weak winds in the lowest part of the troposphere, underlining the importance of the wind profile for the precipitation distribution. The Fig. 7 case differs from Fig. 5 and 6 in the sense that there is more precipitation downstream and stronger low level tropospheric winds suggesting more effective downstream advection of precipitation.

Figure 8 shows a convective case with heavy rainshowers in the afternoon in the mountains. In the evening, there was no precipitation in the mountains, but a few mm on each side of the mountain range. The dynamic reason for this is unclear, but may be associated with downdrafts over the mountains and convergence at the coast. This case has been simulated with the numerical model MM5 with boundaries from the ECMWF (Figs. 9 and 10). The results are surprisingly good, both in terms of quantity as well as in terms of the pattern of evening precipitation on both sides of the mountains.

3. PRELIMINARY CONCLUSIONS

During the summer of 2007, large precipitation graidents were observed in the 700 m high mountain range of SW-Iceland. A study of individual cases shows very variable precipitation patterns, but they can be related to the low level winds.

A numerical simulation (ECMWF/MM5) indicates that at a horizontal resolution of 3 km, reasonably good results can be obtained.

4. ACKNOWLEDGEMENTS

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5. REFERENCES

De Vries, M., and H. Ólafsson, 2003: Precipitation across a mesoscale mountain ridge – The Reykjanes Experiment (REX). Proc. Int. Conf. Alpine Meteorol. (ICAM), Brig, CH, May 2003. 4 p.

Rögnvaldsson, Ó, J. - W. Bao and H. Ólafsson, 2007: Sensitivity simulations of orographic precipitation with MM5 and comparison with observations in Iceland during the Reykjanes Experiment. Meteorologische Zeitschrift, 2007 (16), 87-98.

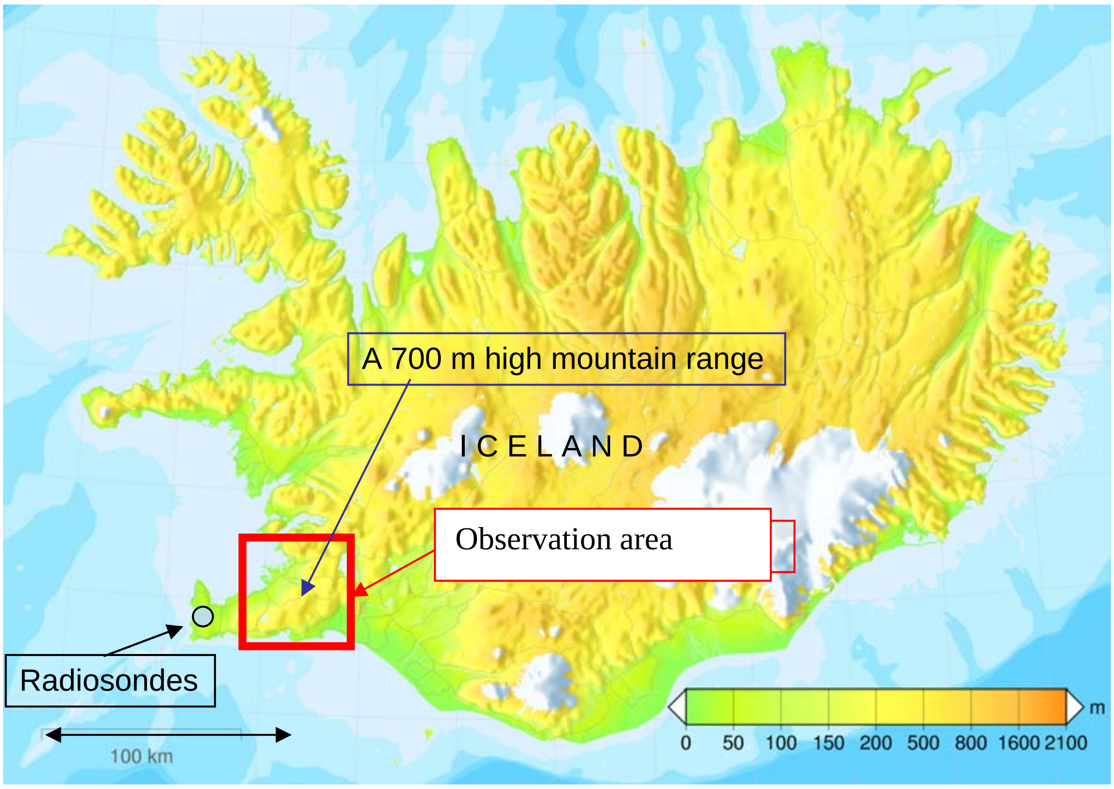

Figure 1. Location of the SKUR experiment.

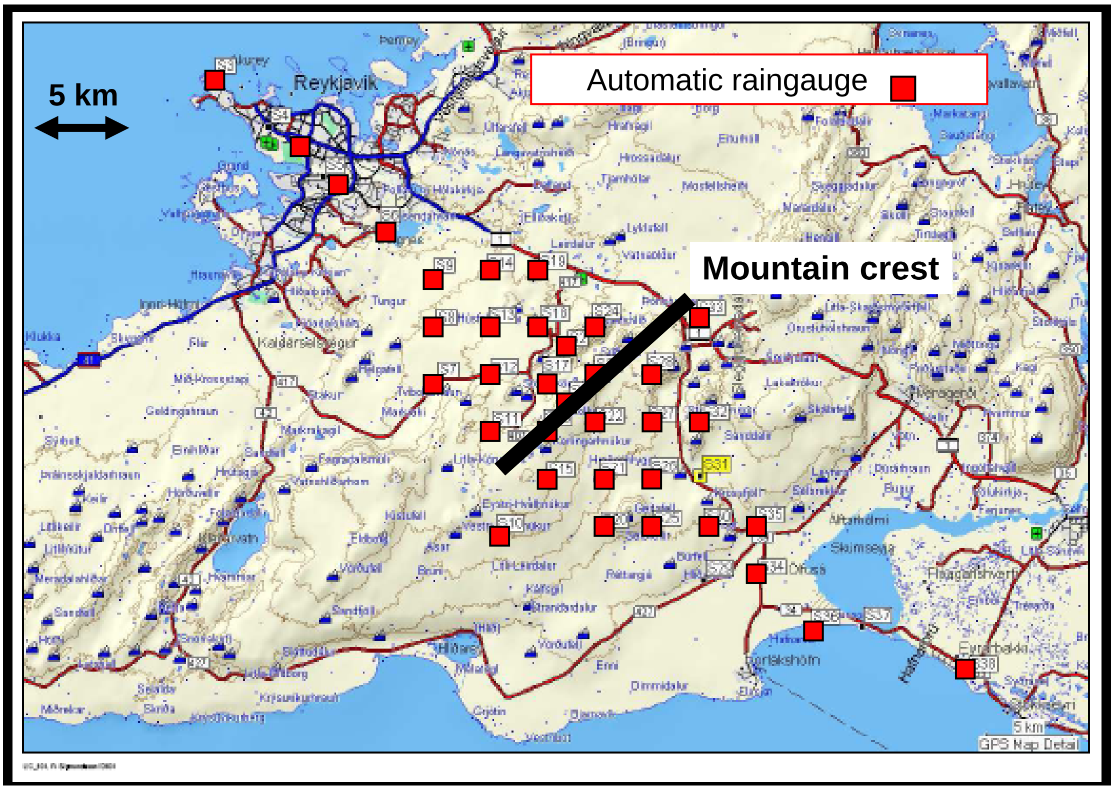

Figure 2. Location of the raingauges in the SKUR experiment.

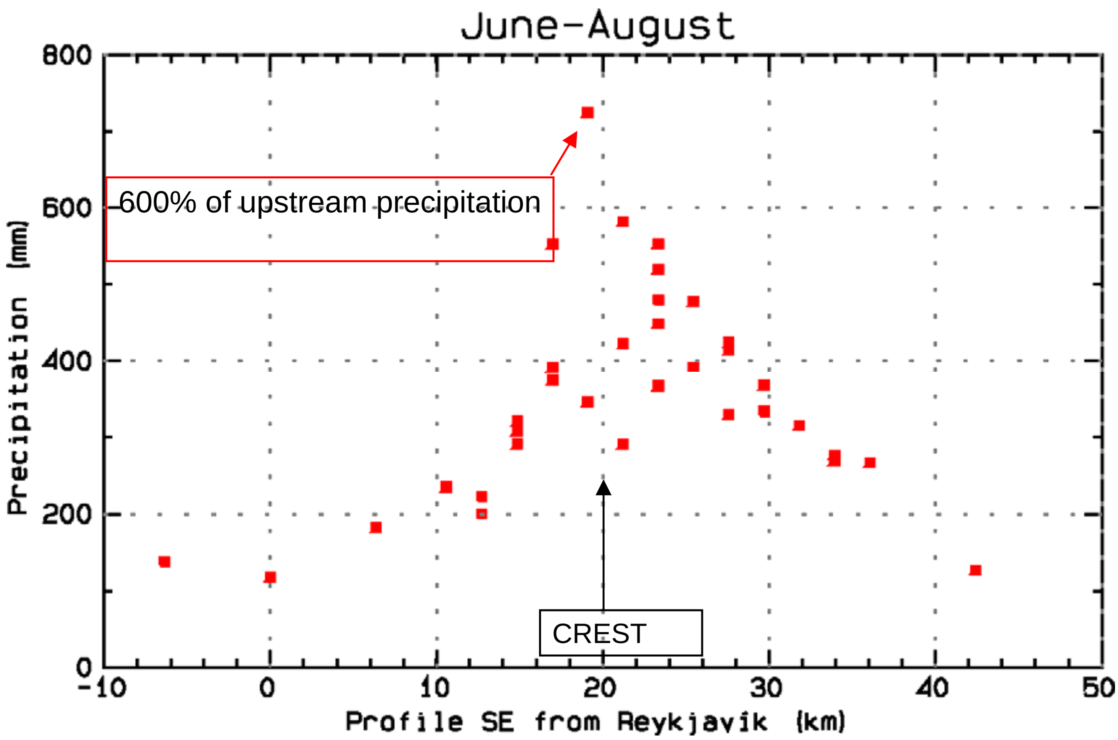

Figure 3. Accumulated precipitation during the SKUR experiment. The profile is from NW to SE and the crest is at 20 km.

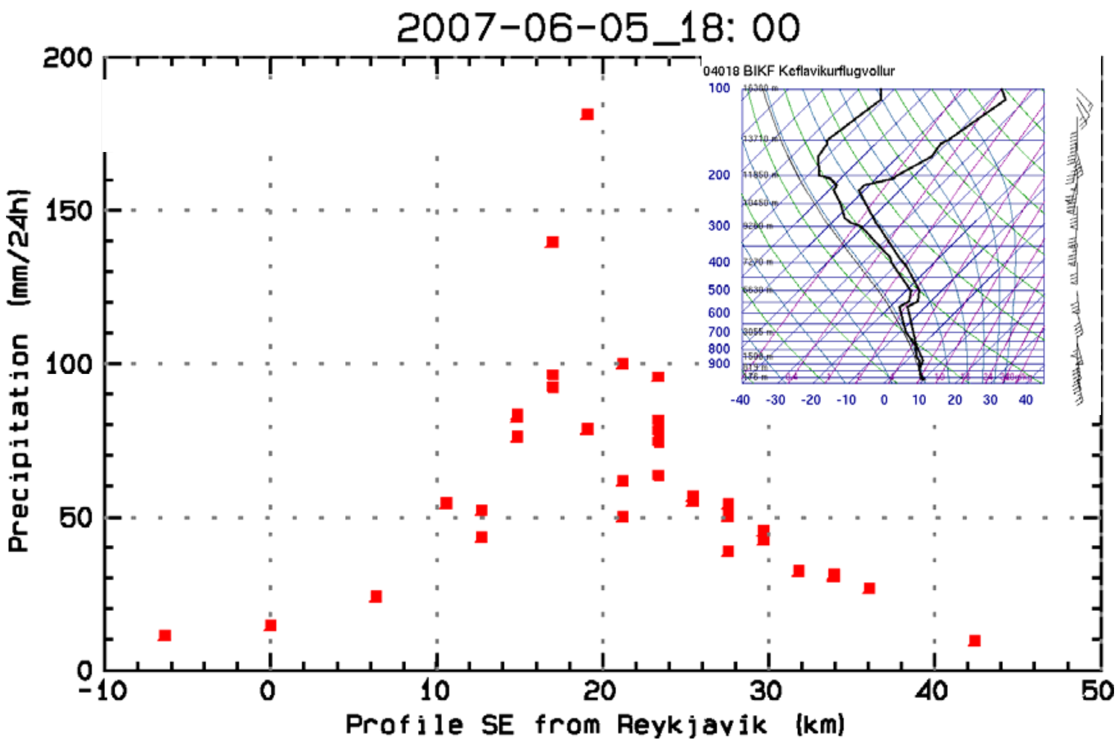

Figure 4. Precipitation distribution during an event with large orographic enhancement of precipitation and maximum precipitation downstream of the crest during the SKUR experiment. The mountain crest is at 20 km and the profile is from NW to SE

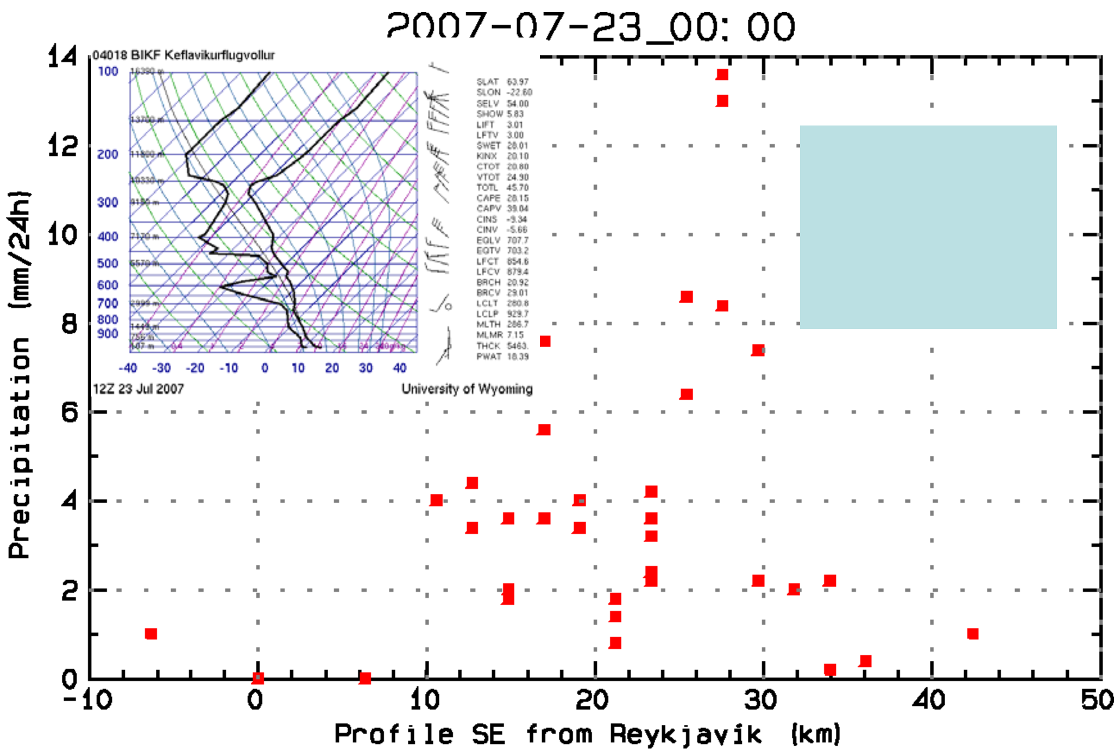

Figure 5. Precipitation distribution during an event with large orographic enhancement of precipitation and maximum precipitation upstream of the crest during the SKUR experiment. The mountain crest is at 20 km and the profile from NW to SE.

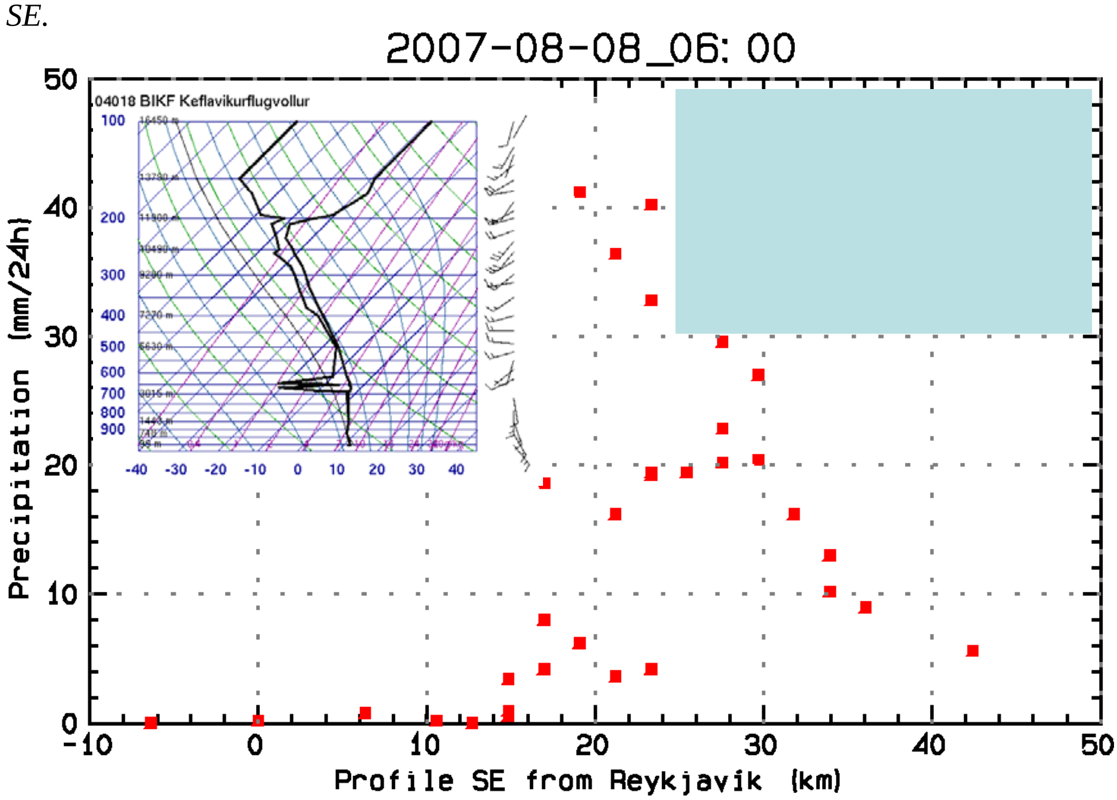

Figure 6. Precipitation distribution during an event with large orographic enhancement of precipitation, maximum precipitation upstream of the crest and much drying downstream during the SKUR experiment. The mountain crest is at 20 km and the profile from NW to SE.

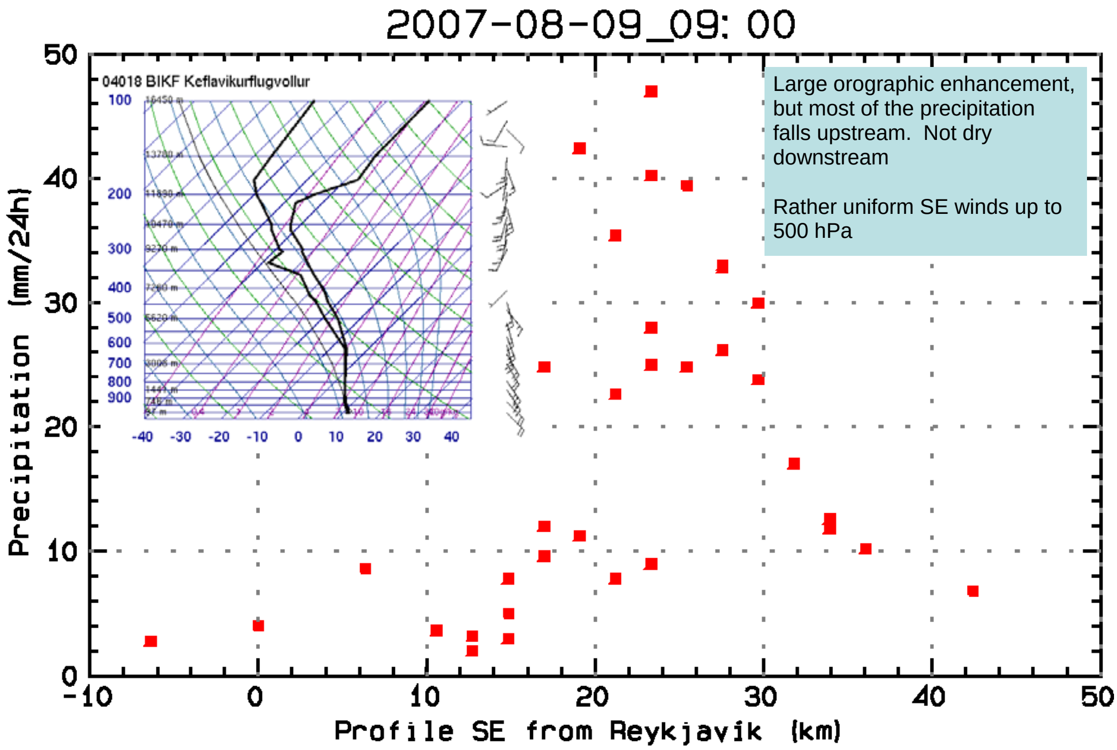

Figure 7. Precipitation distribution during an event with large orographic enhancement of precipitation, maximum precipitation upstream of the crest, but not a complete drying downstream during the SKUR experiment. The mountain crest is at 20 km and the profile from NW to SE.

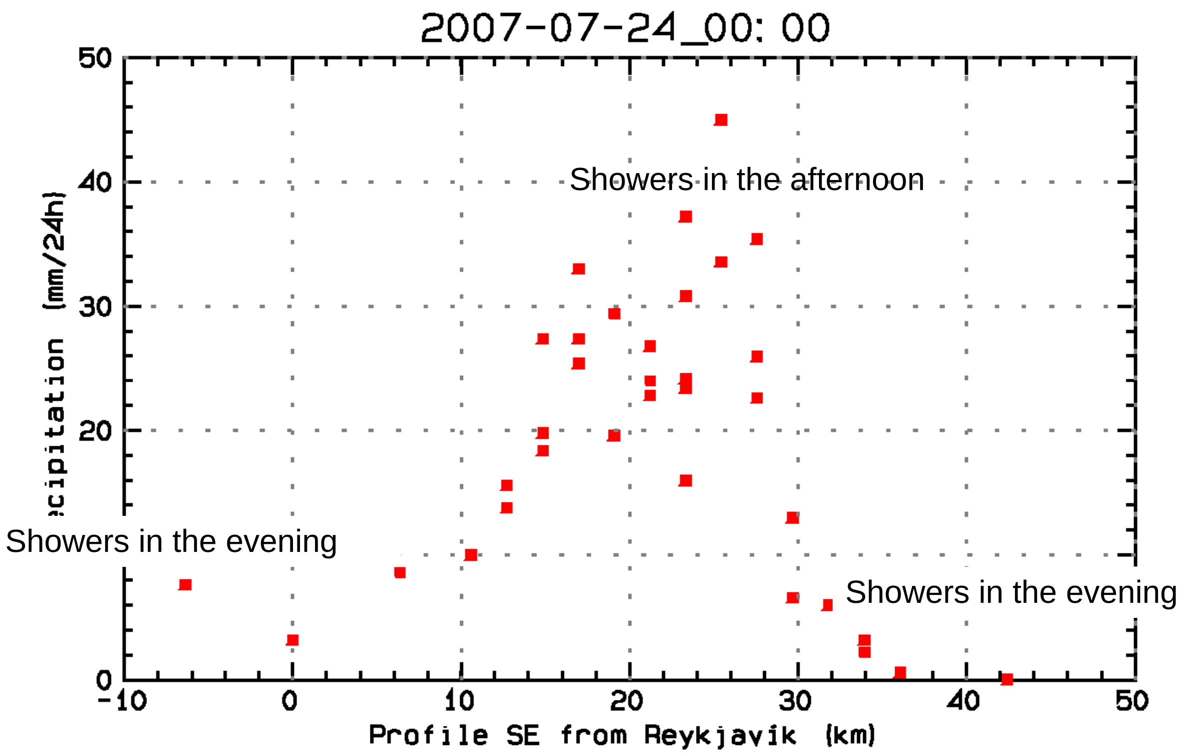

Figure 8. Precipitation distribution during a convective event with some precipitation in the evening on both sides of the mountain range. The mountain crest is at 20 km and the profile from NW to SE.

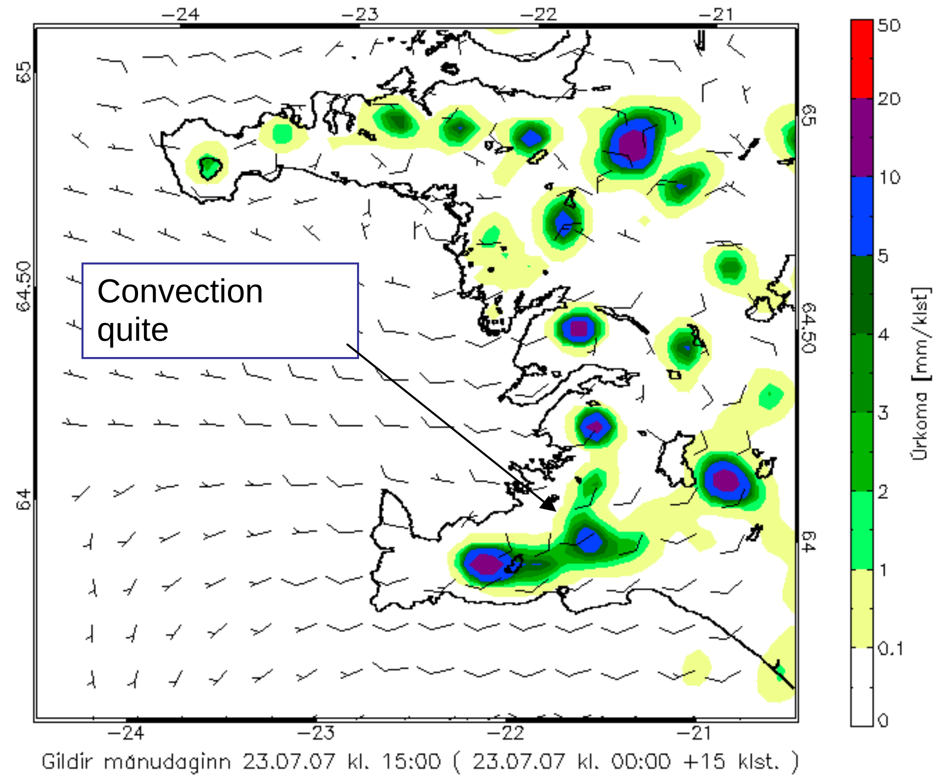

Figure 9. A numerical simulation of precipitation for the case in Fig. 8, valid at 1500 UTC on 23 July 2007.

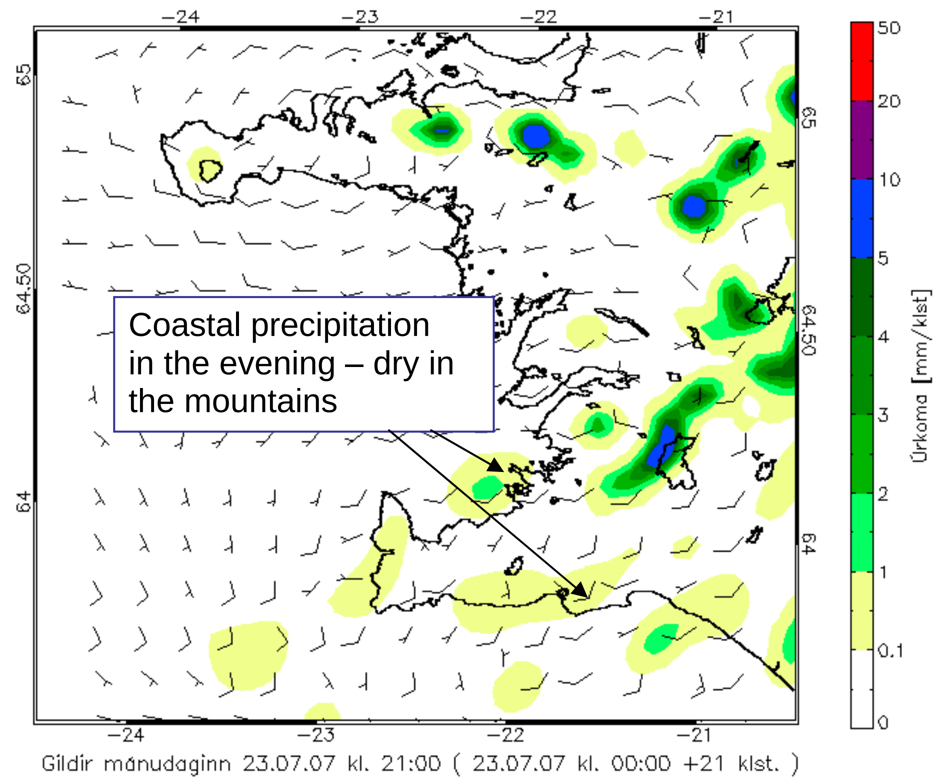

Figure 10. A numerical simulation of precipitation for the case in Fig. 8, valid at 2400 UTC on 23 July 2007.