

## MONITORING THE ATMOSPHERIC BOUNDARY LAYER IN THE ARCTIC (MABLA) - THE GUFUSKÁLAR PROJECT

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**Abstract:** A new project of meteorological observations in a 412 m high mast in the vicinity of Snæfellsjökull Glacier in W-Iceland is described. The project is expected to provide data on various types of orographic disturbances, including corner winds, wakes, blockings and downslope windstorms.

**Keywords:** *MABLA, Gufuskálar, W-Iceland, mast, boundary-layer monitoring, Arctic, turbulent fluxes*

### 1 INTRODUCTION

Climate change, new challenges in fine-scale weather forecasting and unanswered questions on the nature of the atmospheric boundary-layer and mountain meteorology have motivated a new project, Monitoring of the Atmospheric Boundary-Layer in the Arctic (MABLA). The first goal of this project is to establish a monitoring of the atmospheric boundary-layer in a more than 400 m high mast at Gufuskálar at the west coast of Iceland (Fig. 1).



**Figure 1.** Location of the Gufuskálar mast at the west coast of Iceland.

### 2 OBSERVATIONS IN THE GUFUSKÁLAR MAST

The Gufuskálar mast is situated at the tip of the Snæfellsnes peninsula, a short distance northwest of the almost 1.5 km high, but rapidly melting Snæfellsjökull Glacier. A manned weather station was operated at Gufuskálar 1970-1994 and an automatic weather station has been operated there since 1994. The Stykkishólmur weather station that has a temperature series dating back to the middle of the 19<sup>th</sup> century is only a little more than 50 km to the east of Gufuskálar. The main mast of Gufuskálar is 412 m high, while a smaller 40 m high

mast is nearby. The taller mast was erected in 1963 and is currently used for transmitting long wave radio signals. The observations in the masts will consist of automated weather stations recording winds, temperature and humidity at roughly 10, 40, 100, 200 and 400 meters every 10 minutes. In addition, there will be high-frequency observations to assess turbulent fluxes of heat and momentum at 10 and 100 meters and observations of short- and long-wave radiation. Measurements at 10 and 40 metres started in the fall of 2008 and installation of instruments at the remaining levels will be completed during the summer of 2009.

### 3 SCIENTIFIC OBJECTIVES

The Gufuskálar observations serve a multiple purpose. They are expected to provide a description of the atmospheric boundary-layer inside a corner wind in northeasterly flow, an upstream blocking in northwesterly flow and in wakes or downslope windstorms in southeasterly flows. From a forecasting perspective, the data on turbulent transport of momentum down to the surface of the earth during windstorms is expected to give guidance for tuning of parameterization schemes with the aim of improving forecasts of surface mean winds and surface wind gusts (e.g. Ágústsson and Ólafsson, 2009; Rögnvaldsson et al., 2009). From a climatic perspective, future observations from Gufuskálar are expected to complement the exceptionally long Stykkishólmur time-series of temperature. The Gufuskálar project is a long-term investment. The measurements are expected to monitor a plausible climate change associated with the predicted global warming and the retreat of the sea ice north of Iceland. Being located at the shoreline, observations from Gufuskálar can be expected to be useful in describing the marine boundary-layer and for validating algorithms of remotely observed winds over the sea.



**Figure 2.** Installation of equipment in one of the two masts at Gufuskálar, W-Iceland in August 2008.

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