How the mesoscale variability casts doubt on the representativeness of observations near Antarctic Peninsula.
Mountains wall of Antarctic Peninsula
(The part of Kiev Peninsula)
Clouds are often indicate on some special atmospheric processes here.
Orographic effects on flow dynamic

(Long band of atmospheric perturbation of Karman Vortex behind the obstacles)
Mesoscale topography features
Weather station polygon

Vernadsky

Palmer
Logger locations and equipment

1) Logger HOBO H21-USB, 2 Mb internal memory.
2) Temperature and Relative Humidity sensor HOBO S-THB-M002;
3) Wind Sensor HOBO S-WCF-M003.
4) Software: HOBOware_Free

Measurements interval: 5 min
Experiment time: ~20 days (from April 20, 2019)
The mesoscale weather polygon in action
10 days average
Coastal appears under the calm wind condition or week anticyclone vortex. A light warming of dry foehn observe near Vernadsky and catch by the Polar WRF model.

*Polar WRF v4.1.1, 235x250 points, 1km resolution on third nested domain, Initialized from NCEP GDAS 0.25
Strong wind blow from the peninsula mountains. Bright warm core at the nearest mountain foothills.

*Polar WRF v4.1.1, 235x250 points, 1km resolution on third nested domain, Initialized from NCEP GDAS 0.25
The studied observation period is not enough for the reliable statistics on how often and within what limits the deviations should be expected. At the same time, available observations at the mesoscale polygon around Akademik Vernadsky Station show the temperature deviations, that can “unreasonably” reach several degrees.

The wind parameters can be significantly distorted under certain synoptic conditions.

Similar effects should be expected also at the other weather monitoring locations on the Antarctic Peninsula.

High-resolution regional mesoscale models can clarify the conditions and mechanisms for the formation of such forced atmospheric perturbations. However, the models do not always reproduce well the general situation in the atmosphere. Probably the most significant source of model error comes from the initial global analysis.

The comparison of model to extended in-situ observation at the polygon makes it possible to establish situations when model simulations are more trustful and when are less.
For the discussion

Negative impacts of mesoscale variability

Operative weather forecast
Meteorological research
Climate statistic.

Approaches for solving the problem

Statistical filtration (cutting the information)
Is already in use

High resolution models:
1) data assimilation
2) downscaling

Use appropriate observation locations
For future

Set up a high density weather sensors network
Fantastic
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