Fog case studies using the GNSS tropospheric products in Bulgaria

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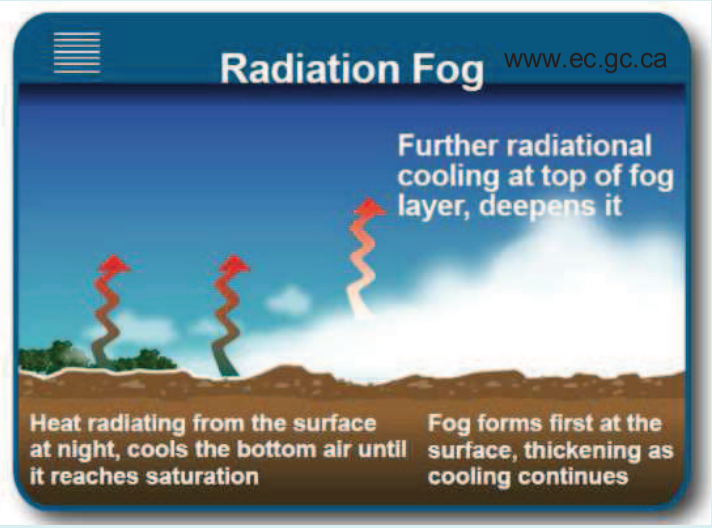
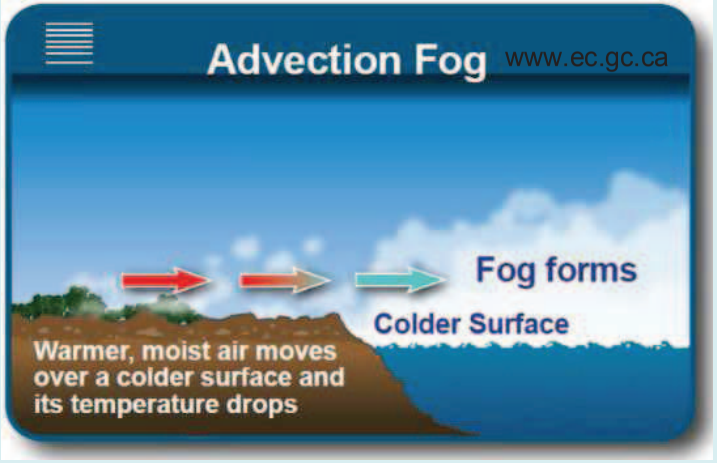
Content:

- THE AIM OF OUR STUDY;
- DATA AND METHODOLOGY;
- FOG CASE STUDIES;
- RESULTS;
- MAIN CONCLUSIONS / SOME FUTURE PLANS.

Fog & Fog forecasting





- A general decision for good forecast is not possible
  - Fog is a local phenomenon;
  - Difficulties in parametrization of fog processes.
- Attracting new methods such as GNSS meteorology.

SYNERGY BETWEEN SYNOP OBSERVATIONS, GNSS TROPOSPHERIC PRODUCT, AND DETAILED SYNOPTIC ANALYSIS

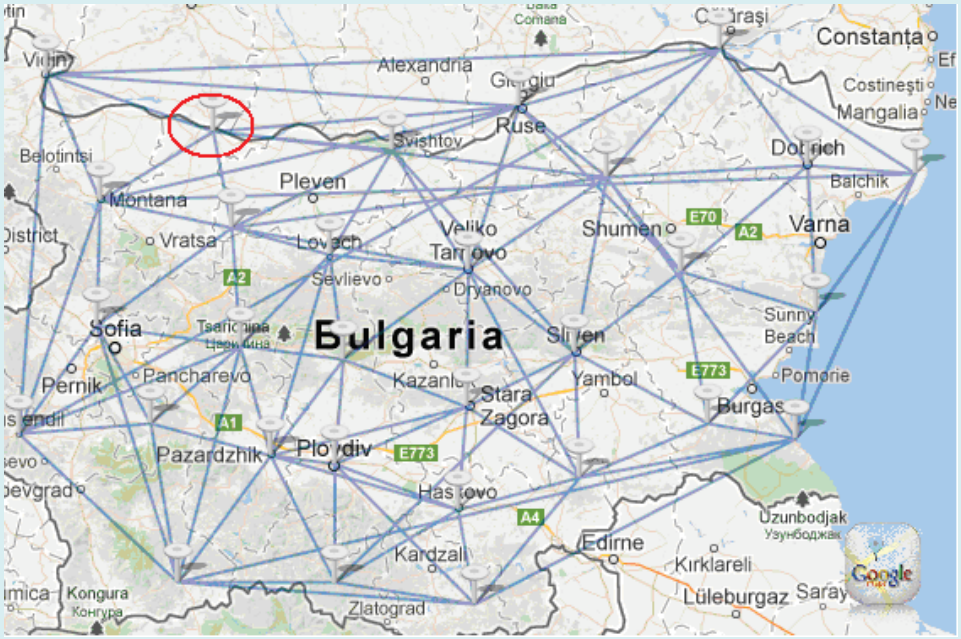
3 case studies in 2012:

21-23 Feb, 10-13 Nov, 25-30 Nov.

- SYNOP 00, 03, 06, 09, 12, 15, 18, 21 UTC for Oriahovo (North Bulgaria);
- GNSS data for IWV, 3-h temporal resolution;
- Synoptic charts.

Methodology

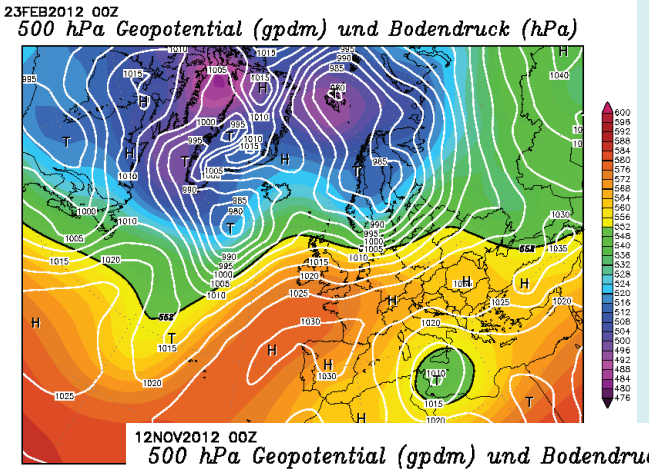
GNSS tropospheric product & *Surface observations*

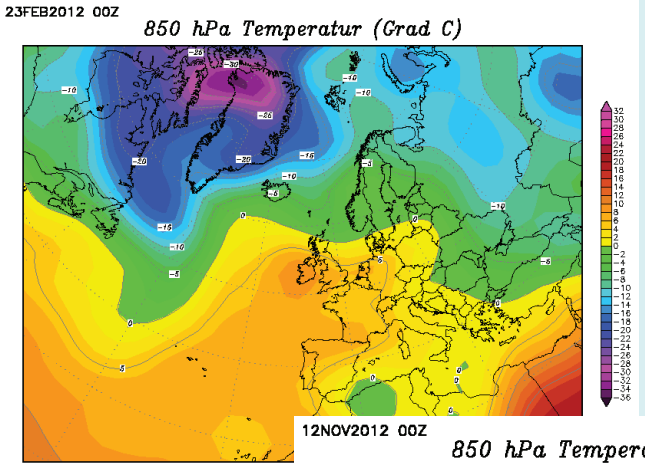


- 2 m air temperature, t [ºC];
- 2 m relative humidity, RH [%];
- horizontal visibility (WMO, SYNOP), VIS [m];
- fog phase and type, wwWW – present and past weather (WMO, SYNOP);
- air pressure at surface, p [hPa];
- equivalent potential temperature [K];
- IWV [kg/m^2].

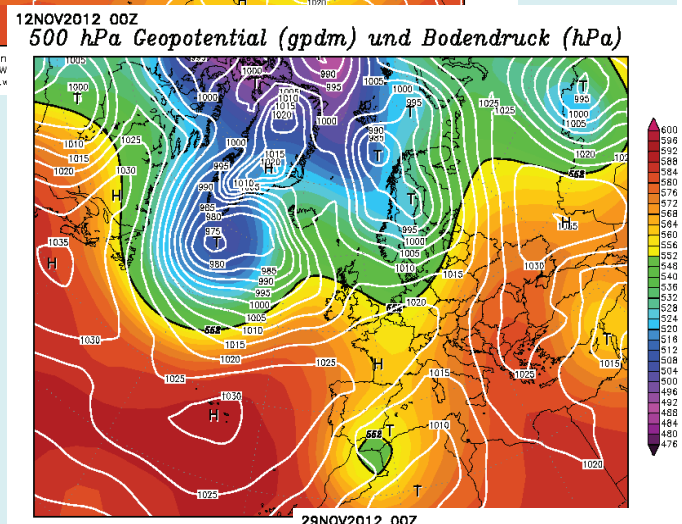
Fog case studies

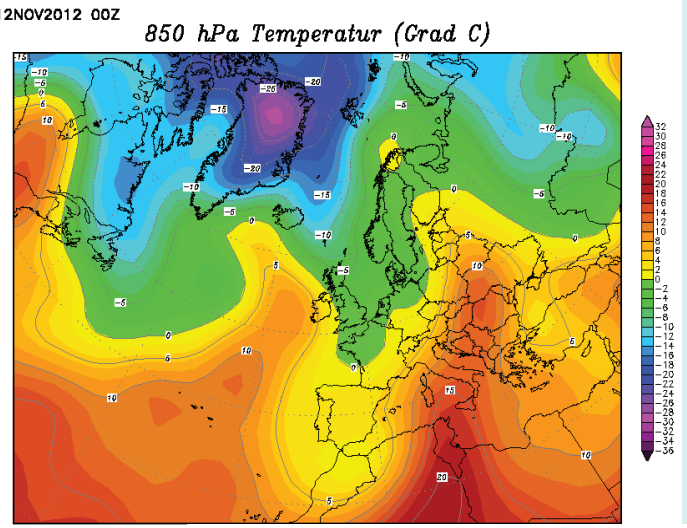
- Case I: 21-23 Feb 2012 – radiation fog
- Case II: 10-13 Nov 2012 – radiation and advection fog
- Case III: 25-30 Nov 2012 – radiation, advection, radiation fog; in addition – dynamical component.



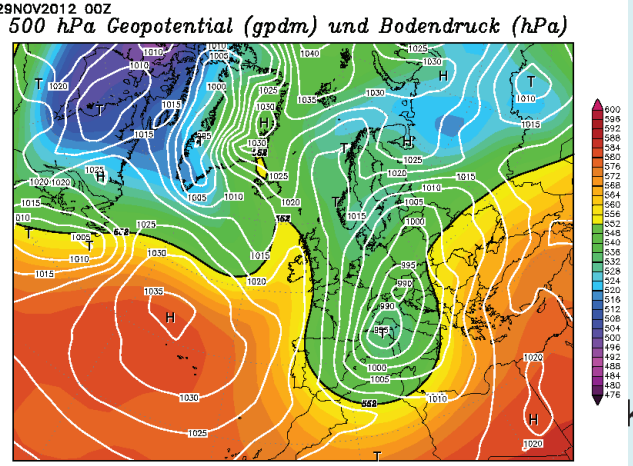


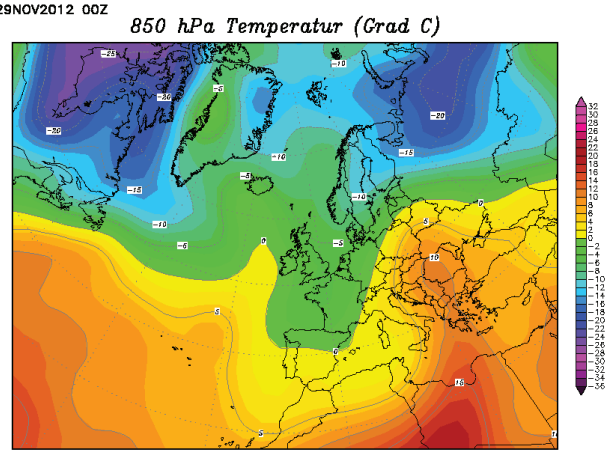
Case study I:
fog duration
21-51 h





Case study II:
fog duration
30-48 h

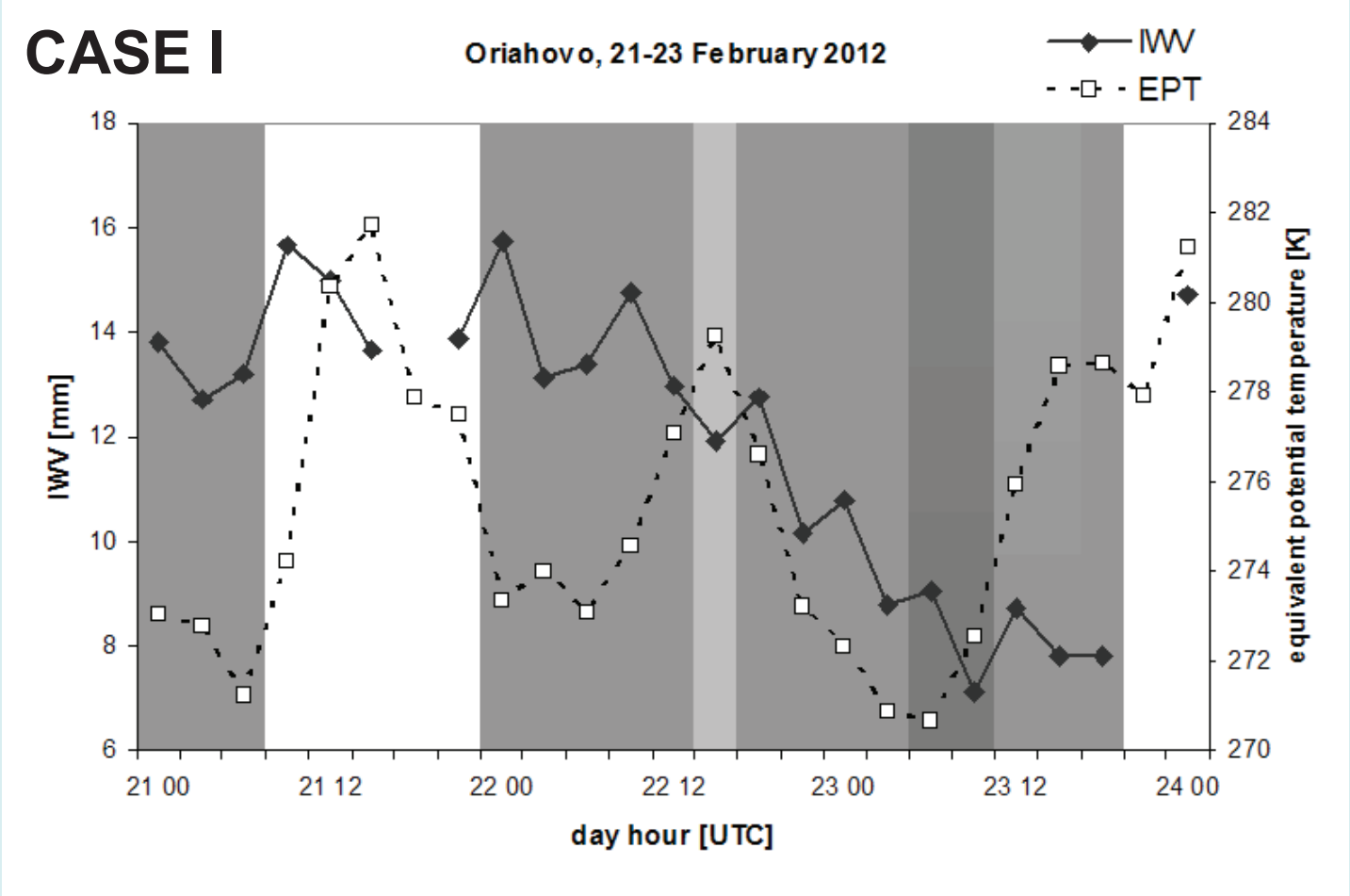




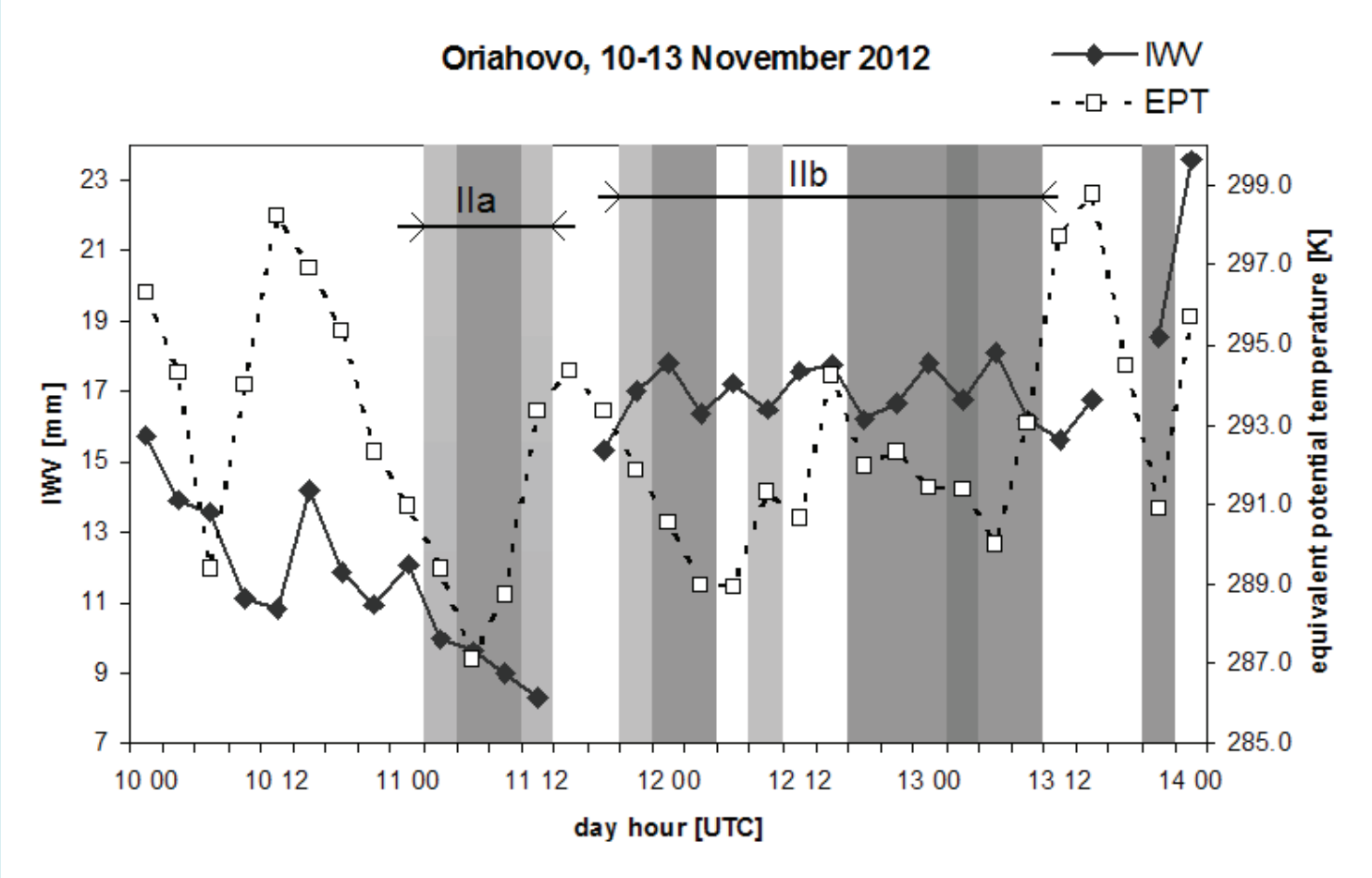
Case study III:
fog duration
27-63 h

k 2015
May 2015

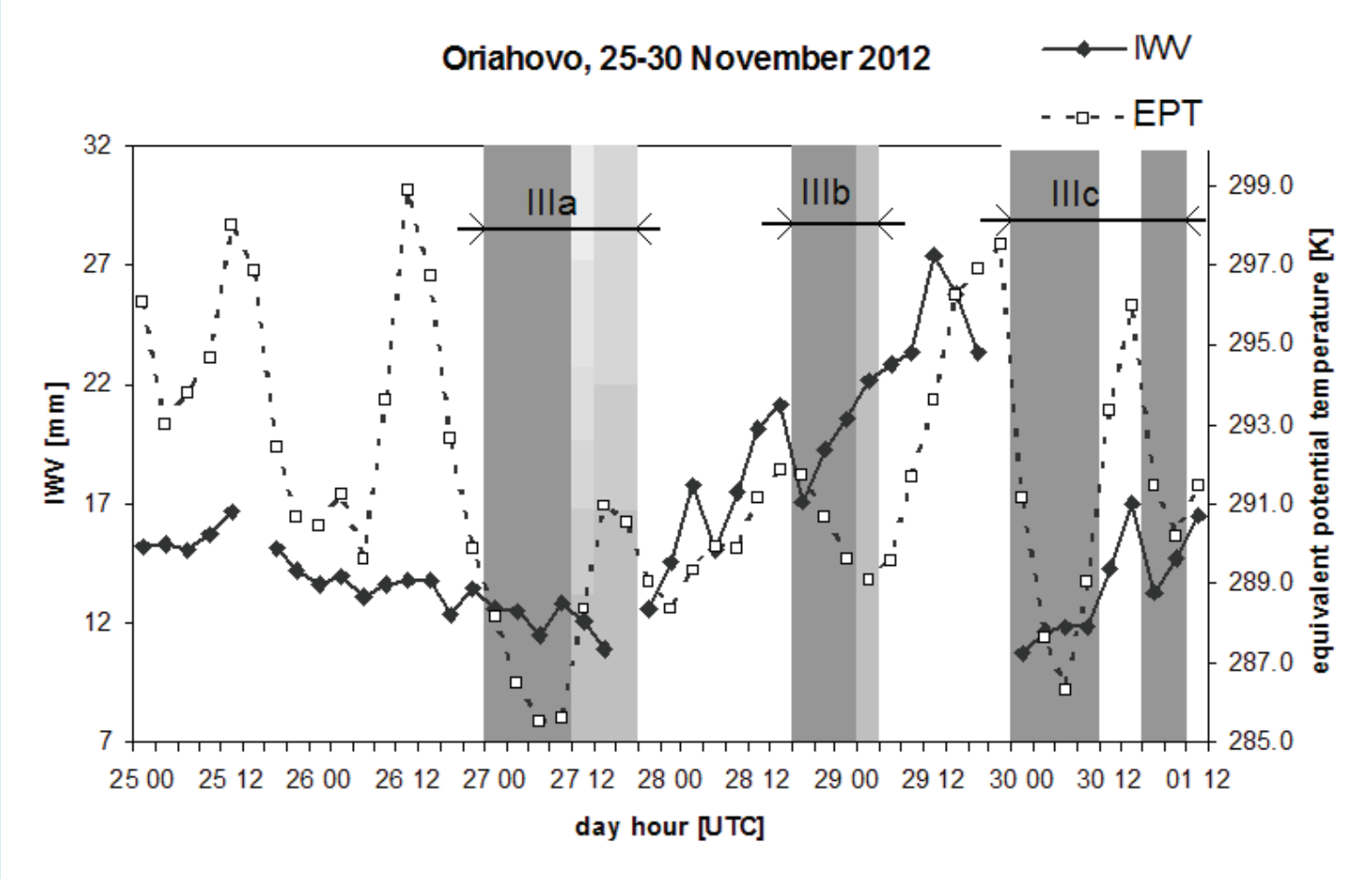
What type of relations we studied in our work?



Case II: radiation part IIa and advection part IIb



Case III: radiation part IIIa, advection part IIIb, and radiation part IIIc



Conclusions / Future plans:

- IWV shows a high sensitivity to air mass transformation;
- Advection of humid air mass at altitude can be tracked in IWV time series;
- Lowest values of IWV and EPT are detected during lowest visibility during radiation fog;
- IWV decrease leads to fog formation and/or fog densification;
- Increase of IWV linkes with fog dispersion;
- IWV encourage us to look for complex interaction between air masses and its local realisation over fog life cycle.
- Extending the study to other locations in Bulgaria and more cases;
- Investigations in better resolution;
- Access to the real-time GNSS tropospheric products will be an additional motivation for the development of an operational tool;
- More investigation needed to get more clear correlation between IWV and EPT.

Thank you!