



Sofia University „St. Kliment Ohridski“
Faculty of Physics



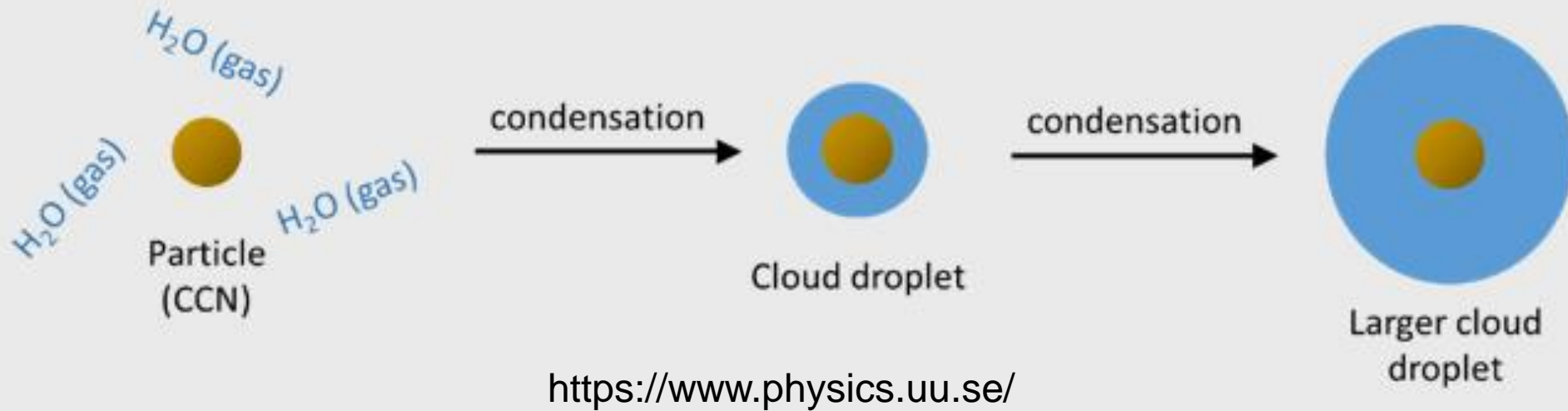
Department of Meteorology and Geophysics

Fourth Scientific Seminar
„Physics and chemistry of the Earth System“

Air masses and cloud condensation nuclei
at Moussala peak

9-11 October 2022, Banya
Viktoria Kleshtanova

Cloud condensation nuclei - overview



Methodology

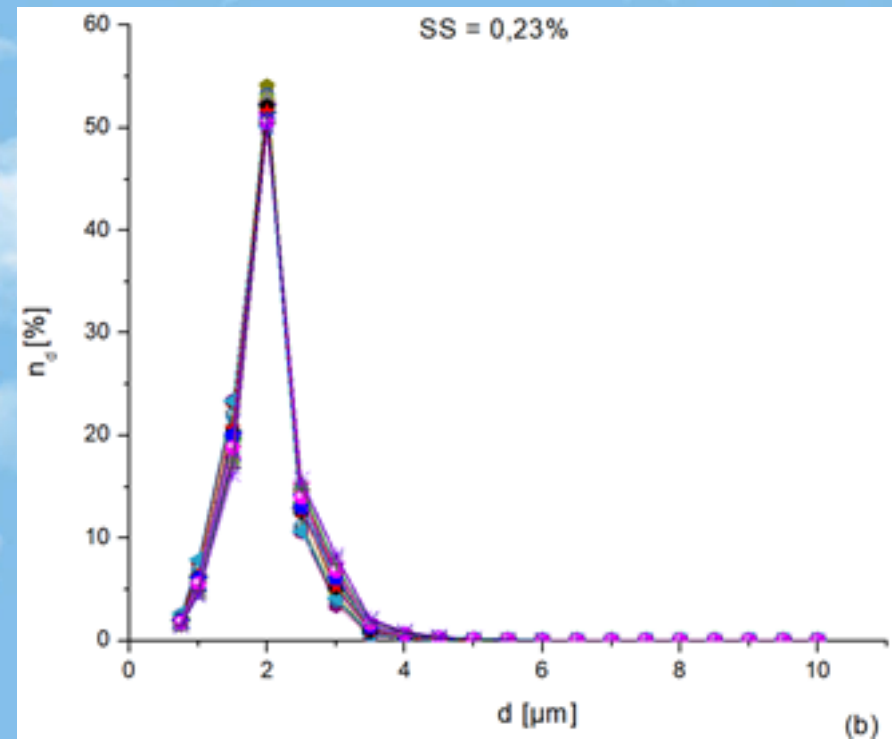
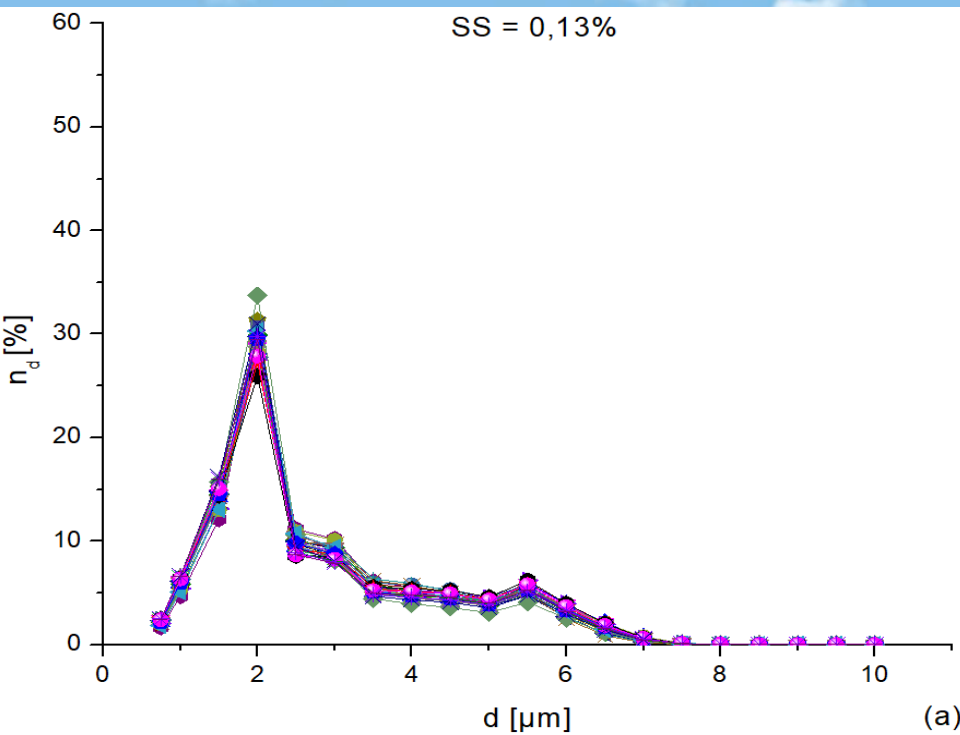
- ✓ Period: July 2016 and December 2016
- ✓ Data:
 - CCN, six SS [%] (0.13; 0.23; 0.43; 0.63; 0.83; 1.03);
 - NCEP/NCAR Reanalysis - geopotential height at 700 hPa, temperature anomaly at 700 hPa
 - Wind's direction and speed [m/s] at 700 hPa
 - HYSPLIT backward trajectories of the air masses

Methodology - 2

- **HYSPLIT backward trajectories of the air masses**
- ❖ Sea and Continental - relative to the underlying surface over which the relevant air mass moves most of the time.
- ❖ Low, Medium and High - Depending on the thickness of the layer of the atmosphere in which the relevant trajectory moves.
- ❖ Atlantic, Mediterranean, Continental and Low gradient pressure - regard to synoptic conditions.

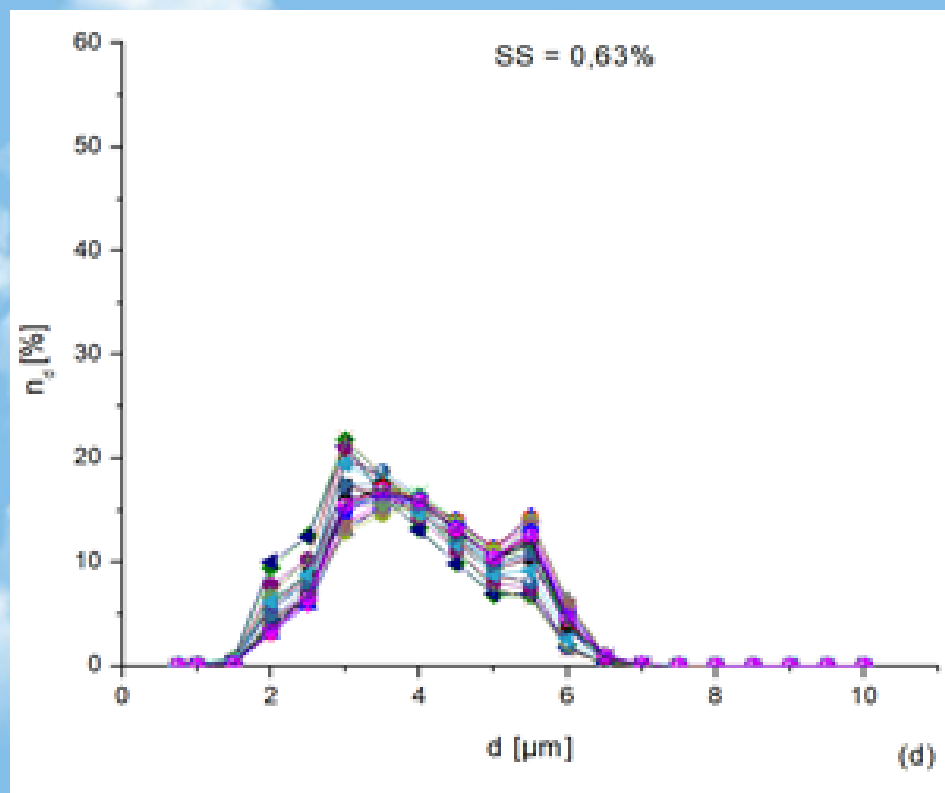
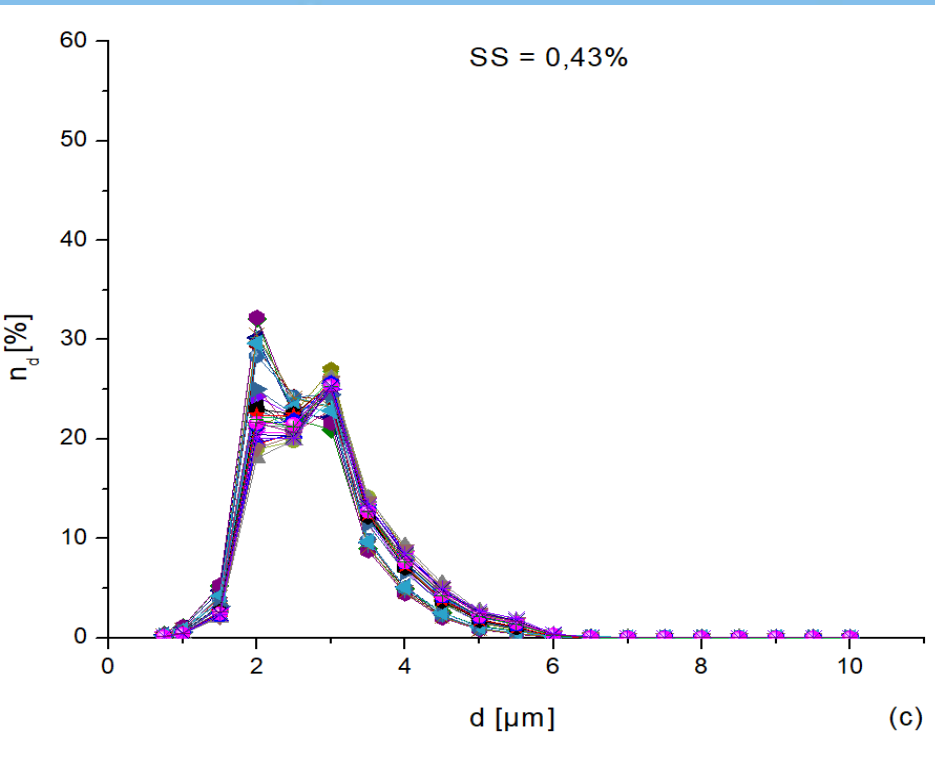
Distribution of CCN in July

$$n_d = \frac{N_d}{N} \cdot 100 \%$$



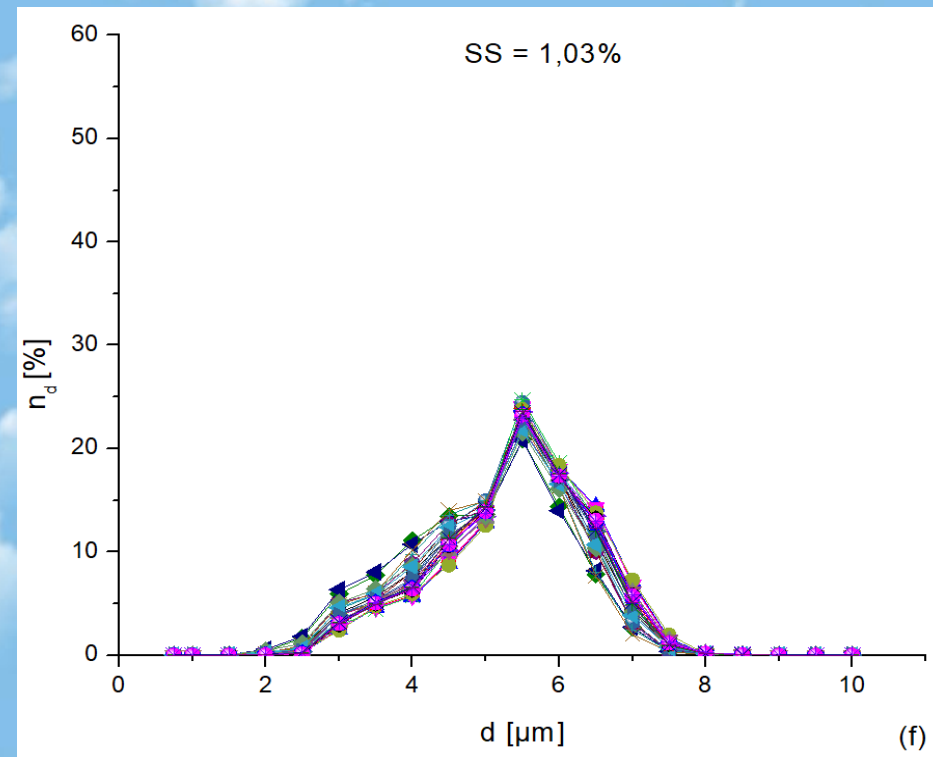
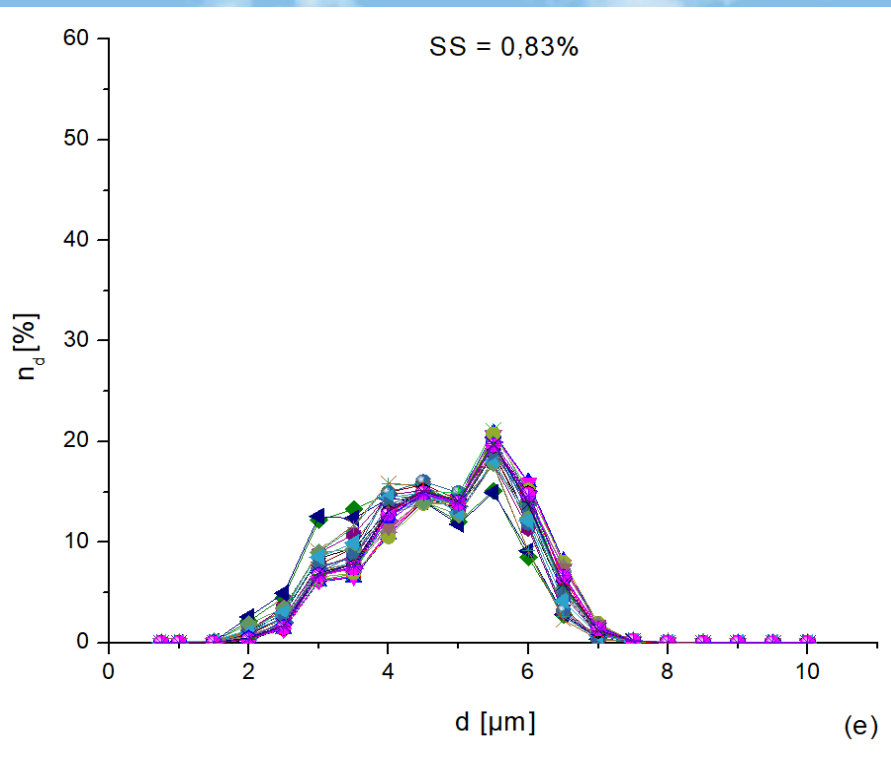
Distribution of CCN in July - 2

$$n_d = \frac{N_d}{N} 100 \%$$

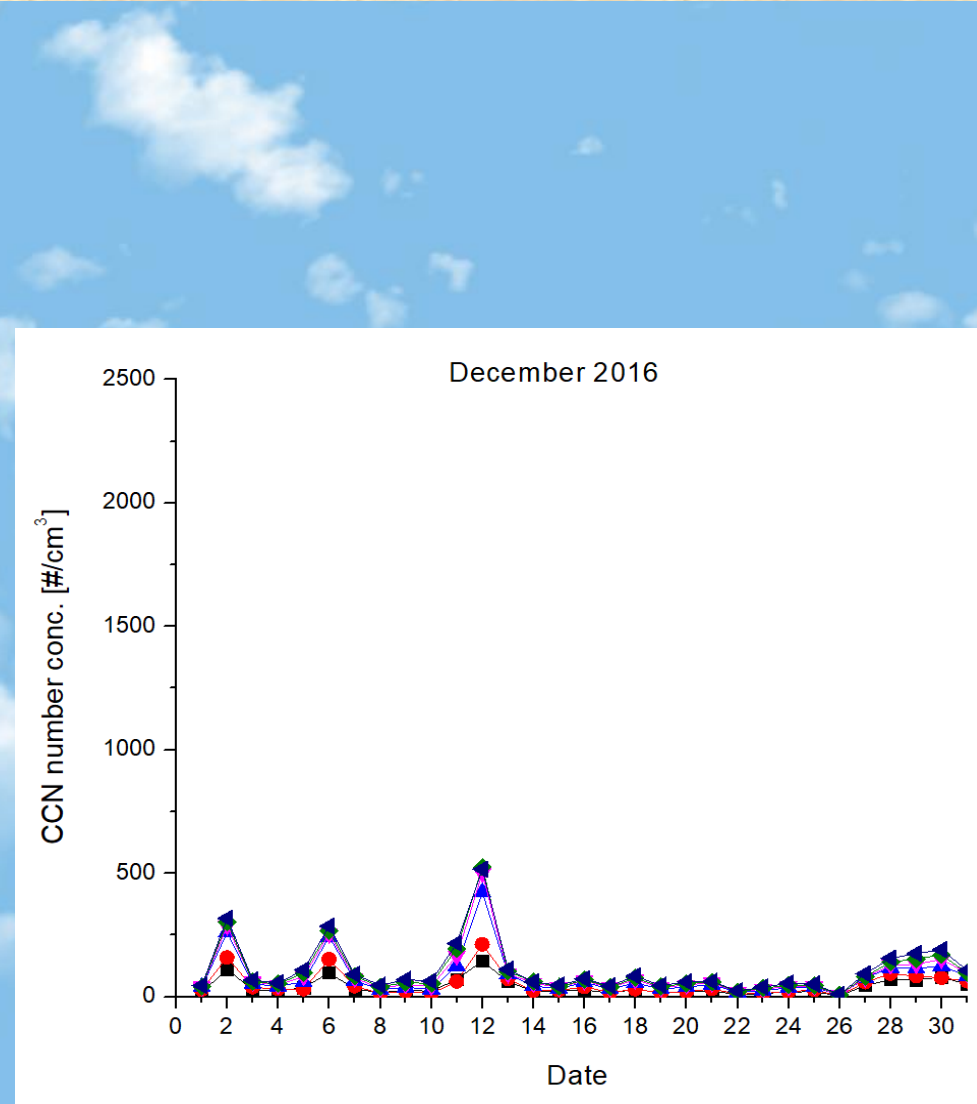
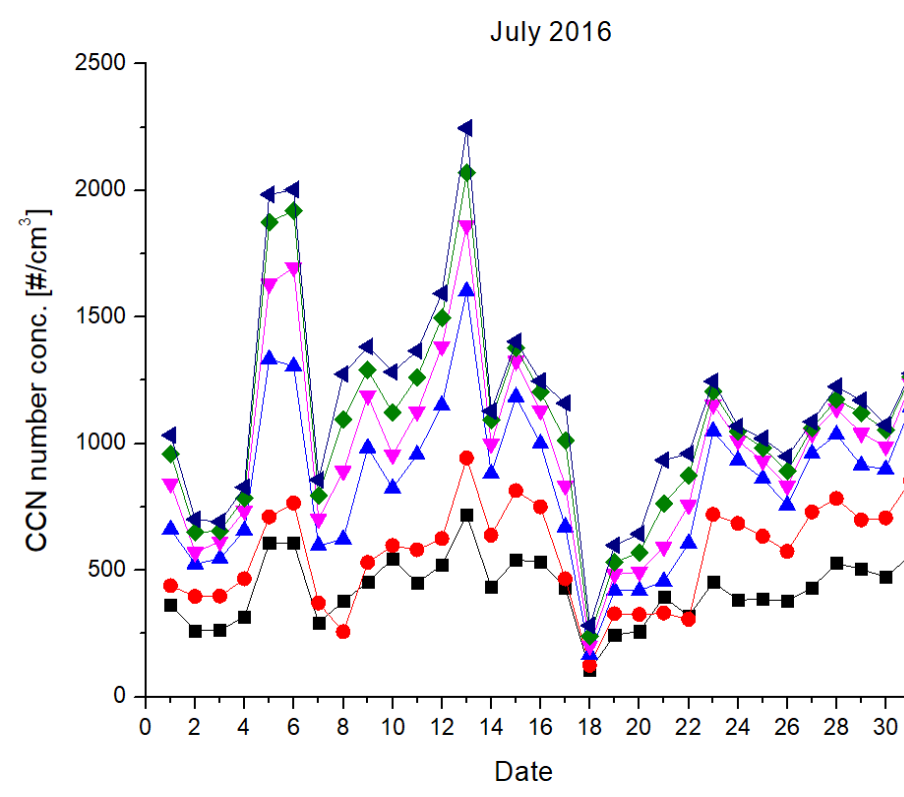


Distribution of CCN in July - 3

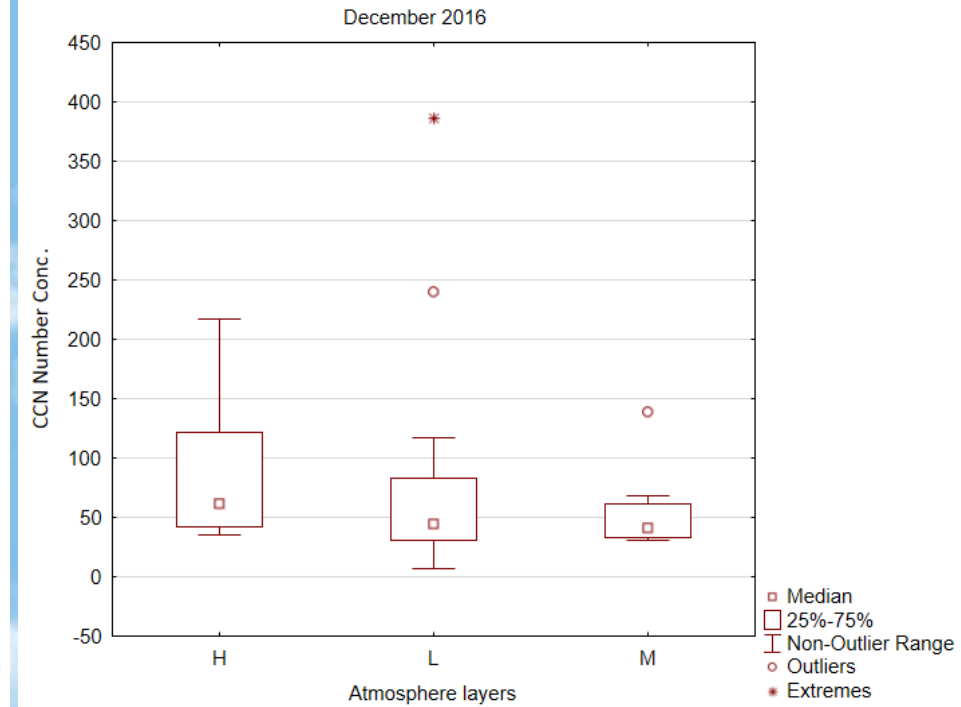
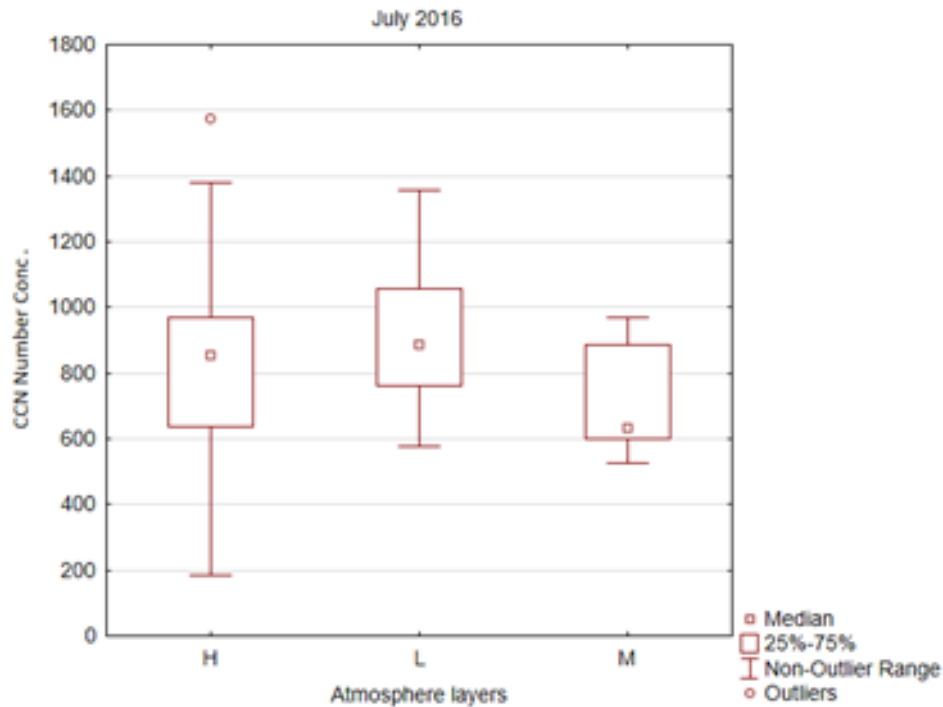
$$n_d = \frac{N_d}{N} 100 \%$$



CCN number concentration in July and December

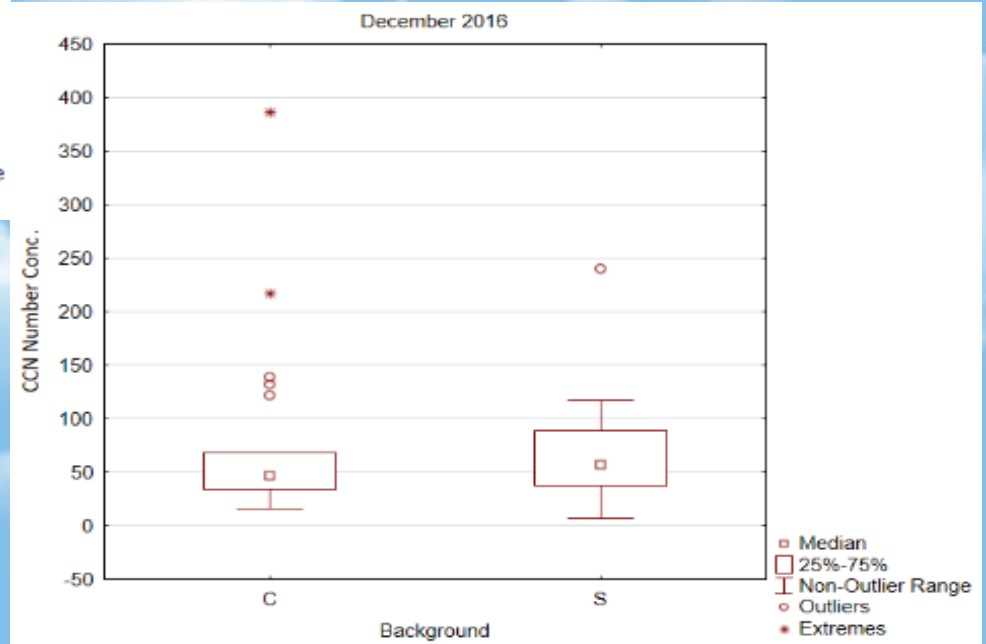
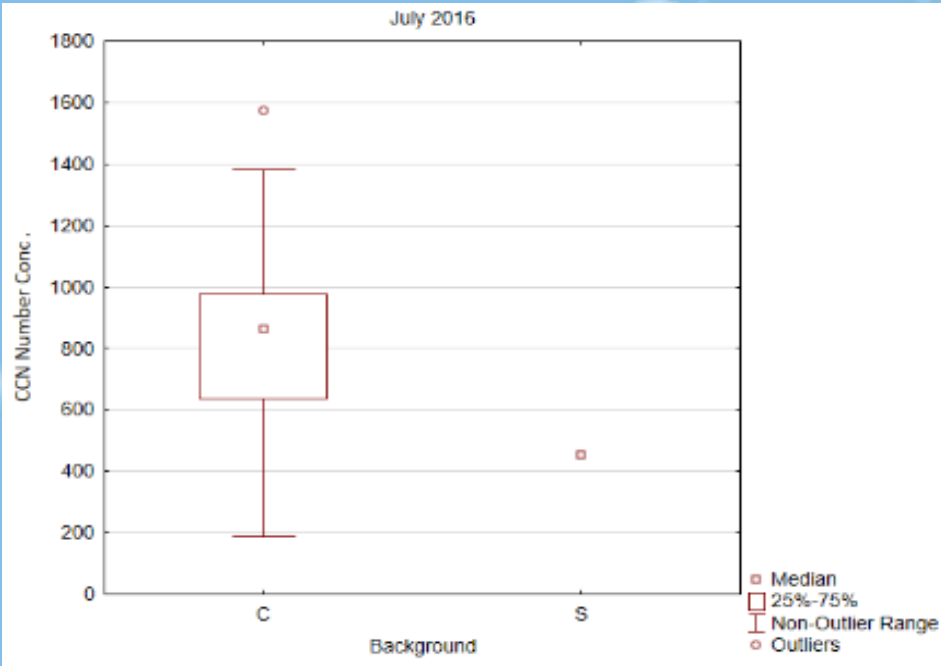


CCN number conc. grouped by atmosphere layers

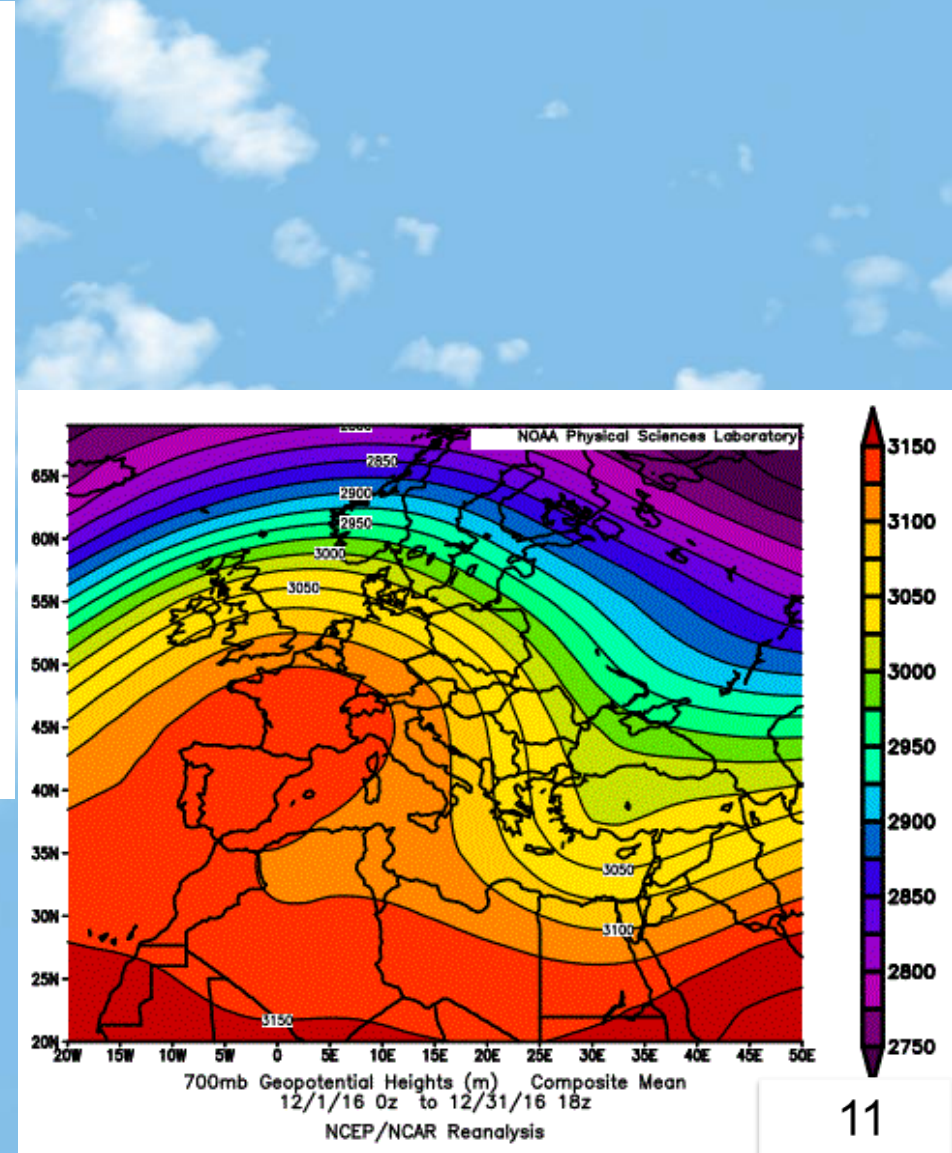
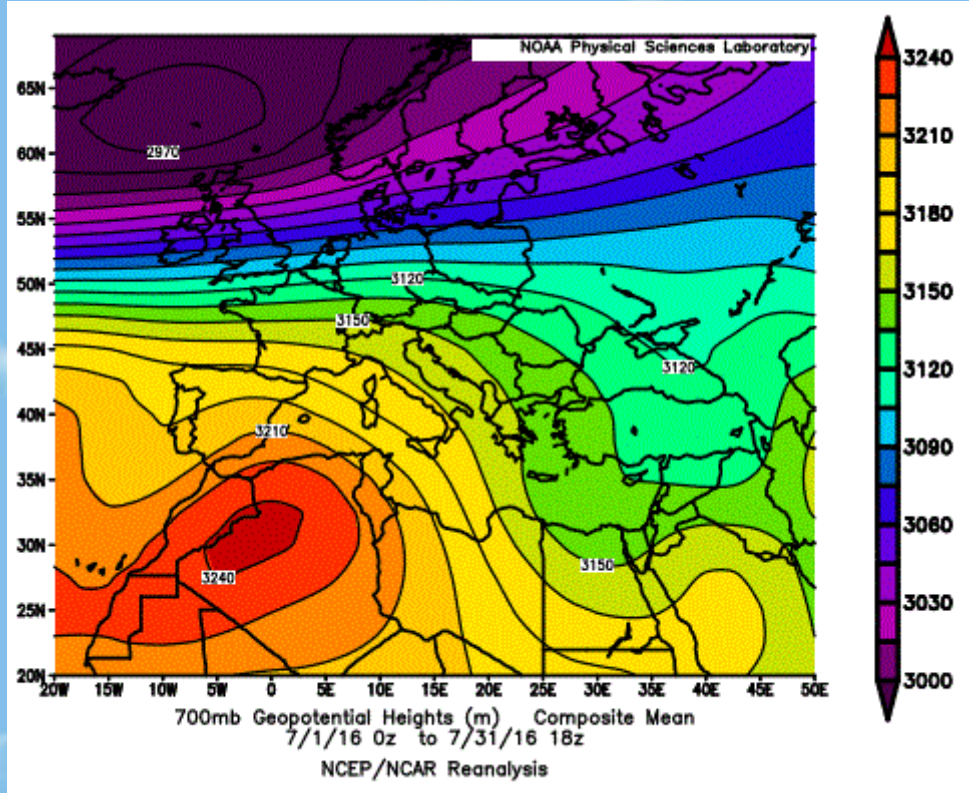


Number of days	July	December
Low	9	13
High	17	10
Medium	5	8

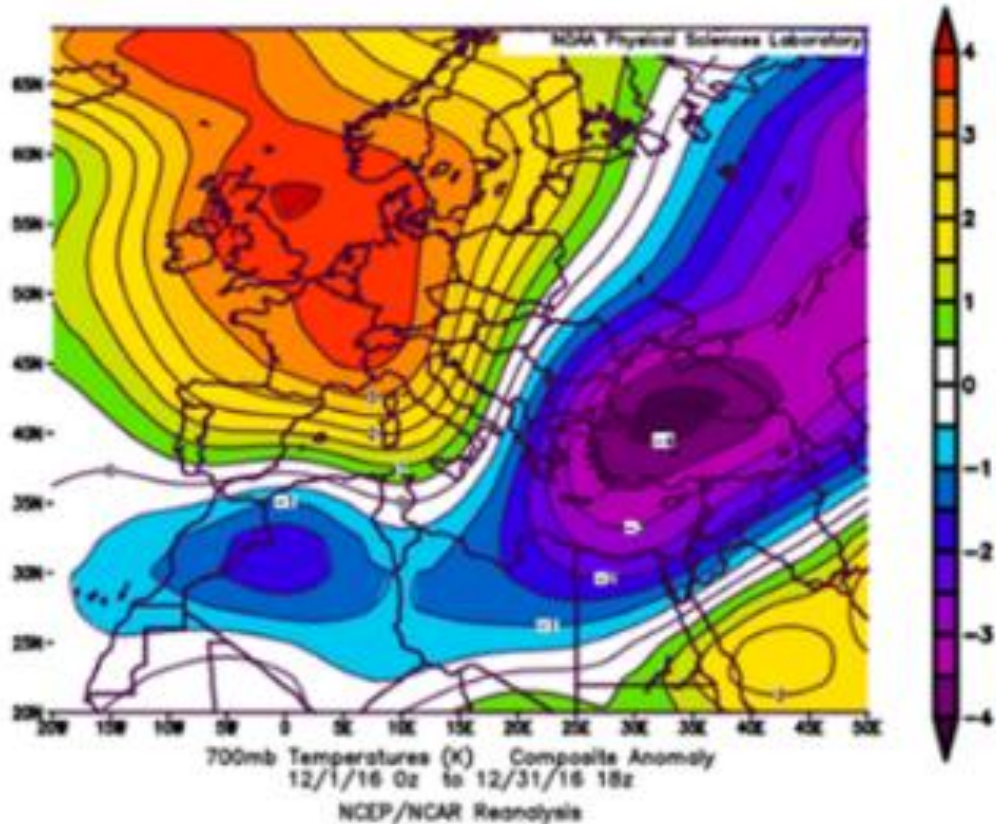
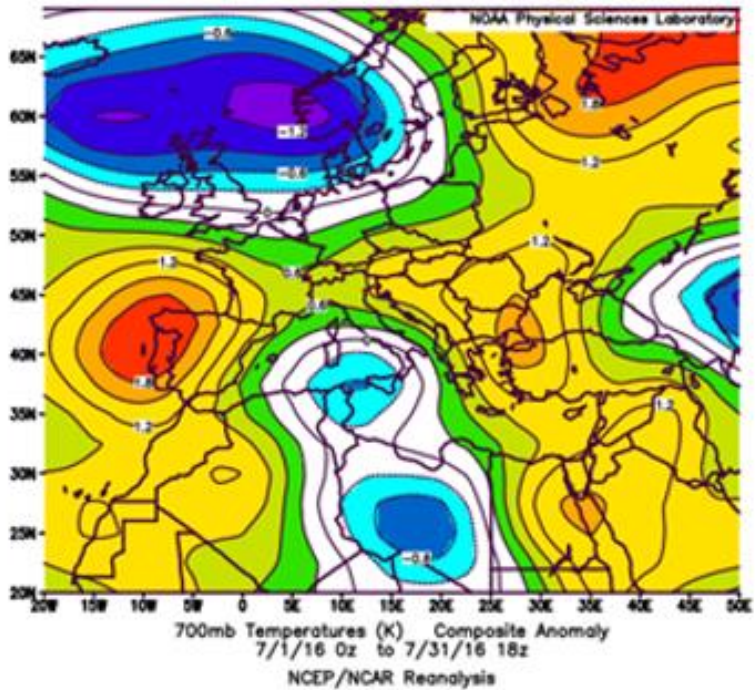
CCN number concentration grouped by underlying surface



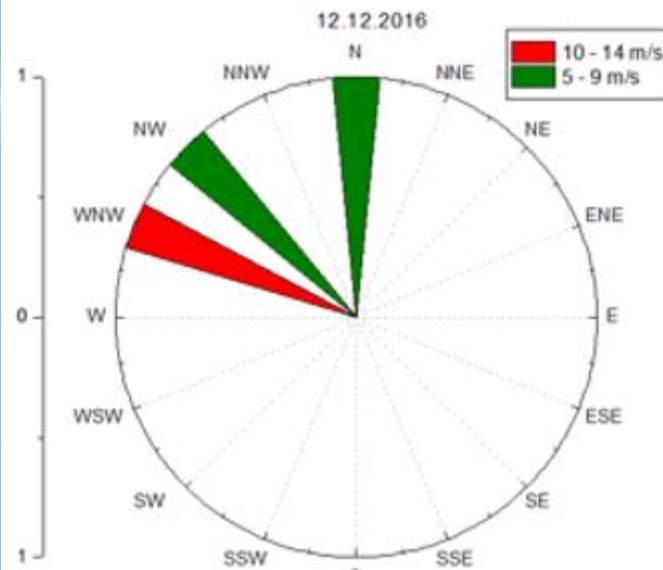
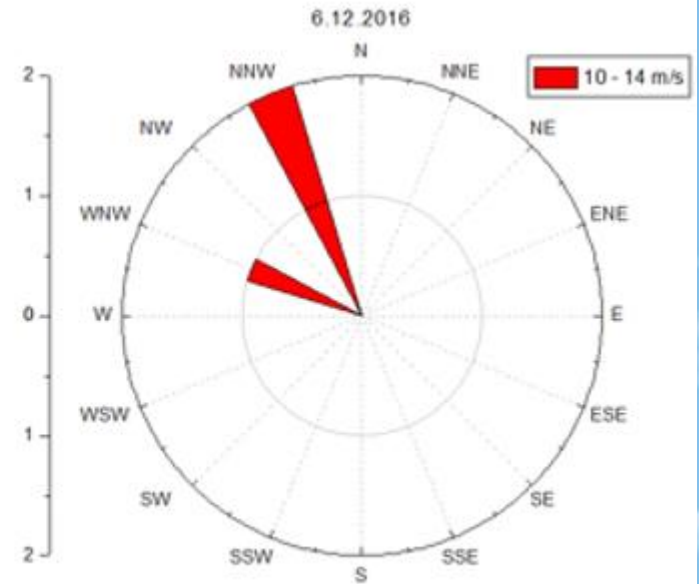
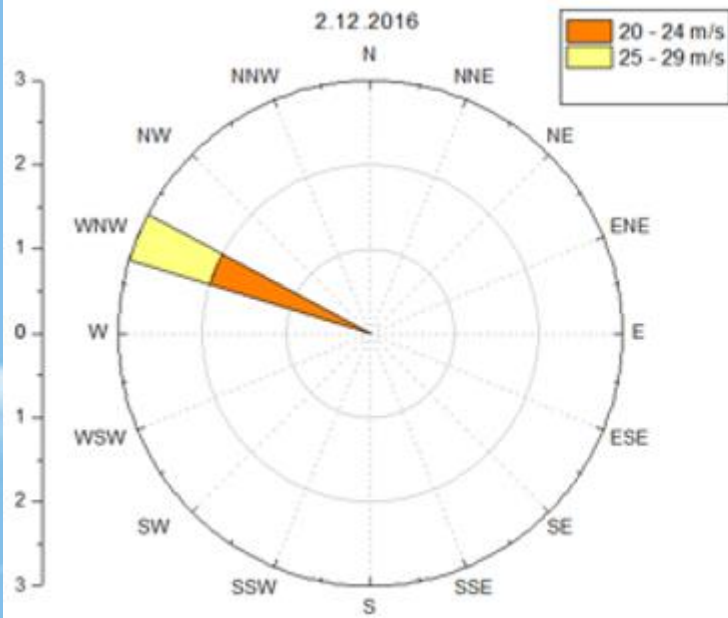
Geopotential mean at 700 hPa NCEP/NCAR Reanalysis



Temperature anomaly at 700 hPa NCEP/NCAR Reanalysis



Wind roses in in December



Conclusions

- Two months – May and July 2016
- The cloud condensation nuclei (CCN) measured at the highest peak of the Balkan peninsula - Moussala peak.
- In July the CCN number concentration is much (even 5-7 times) higher than in the winter.
- Three basic CCN sizes from all 20 sizes: 2 μm , 3 μm and 5.5 μm
- In July: 5th, 6th and 13th (the maxima), and 18th (the minimum).
- In December there are three clear maxima on 2nd, 6th and 12th.
- In July the maxima of CCN concentration corresponds to a anticyclonic type of the geopotential mean at 700 hPa.
- In December the Balkans is influenced by a baric trough.
- In both months continental air masses prevailed – 30 days in July and 21 days in December.

*Thank you for your
attention!*