# Agnarmælingar í andrúmslofti á gamlárskvöld 2018

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#### **Fireworks in Iceland**



- High amount of fireworks imported
   every year
- PM10 observation at night NYE not correlated to dimension of import
- Weather conditions determine level of air pollution
- Calm conditions and low level inversion favours bad air quality

Dust caused by fireworks, 1st January 2018 around 1 am



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#### **Equipment installed during the experiment**

- Three webcams at the roof of IMO building
- Lidar and ceilometer installed in the trailer situated and the meteorological measurments field
- Optical Particle counter (OPS 3330, TSI inc.) within an enclosure collocated to the trailer
- Multigas instrument was not sensitiv enough
- Environment Agency (EA) of Iceland station in ~4 km distance to IMO





## Weather conditions on NYE 2018/19

- Sleet and snow was observed during the morning hours but it cleared off in the afternoon
- Temperature and relative humidity decreasing towards midnight
- Inversion developed during NYE night
- Wind turned to east but almost calm conditions
- In the afternoon on New Year's Day wind speed was increasing as well as the relative humidity and temperature





Veðurstofan, suðaustur - 2019-01-01 09:00

eðurstofan suðvestur



Sulphate dioxide, Nitrogen dioxide and Hydrogen sulphide on NYE 2018 in Kópavogur



### EA Iceland

#### measurements

- hourly PM10 and PM2.5 measurement in Kópavogur valley
- continuous increasing towards midnight
- PM10 second maximum in afternoon
- very high level of SO<sub>2</sub> at midnight, but the whole evening of NO<sub>2</sub>
- H<sub>2</sub>S concentrations unrelated to fireworks





#### **OPC measurements**

- OPC size range: 0.3 to 10  $\mu m$
- Particle number concentration measured in 16 size bins
- Particle number converted in PM1, 2.5, and 10
- PM concentration decrease 22:30 -23:30 UTC due to very popular TV show
- Max. PM concentration one o'clock
- High number and mass concentrations of particles smaller than 1 μm around midnight
- Secondary peak probably due to resuspension in the afternoon
  - doesn't show for fine particles



#### **Atmospheric Lidar and Ceilometer Network**



- Vaisala CL31 / CL51
- pulsed laser (Indium Gallium Arsenide); 910 ± 10nm
- Meas. range: 7500 / 15000 m
- Meas. resolution: 5 or 10 / 10 m
- Leosphere WINDCUBE 200S-AT
- pulsed lidar; 1543 nm
- Meas. range: 50 to 12000 m
- Range resolution: 25, 50, 75 or 100 m
- Scanning Doppler lidar (0 ...360°; -10 ... 190°)
- Depolarization channel



#### **Ceilometer measurements**



- precipitation until noon (sleet or snow)
- clear off in early afternoon
- increase of beackscatter in afternoon due to firework release

- high density around midnight
- resuspension in afternoon
- starts snowing around 17 UTC



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#### **Lidar measurements**



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- Backsatter coefficient shown above but depolarization ratio in bottom
- Sleet or snow before noon on NYE
- Clear off but inversion develops and level of air pollution increasing
- Firework particle seems to be non-spherical
- Re-suspended particles observed in afternoon



#### Summary and outlook

- New Year's Eve fireworks produce a high level of particulate matter
- Air pollution in the boundary layer was observed with different instruments
- Ceilometer seems more sensitive to fireworks pollution then
  the lidar
- A higher resolution preferable but purpose is to monitor volcanic ash cloud
- Depolarization channel helps to distinguish different types and shapes of particles
- Data can be useful for interpretation of volcanic ash cloud
- Instruments moved to a dusty environment to study physical properties of particles released in a dust storm as test case for volcanic eruption



