Air pollution changes over Switzerland due to COVID-19 corrected for meteorological influences

GEO Health Community of Practice weekly telecon, 24 Apr 2020

Dominik Brunner, Gerrit Kuhlmann, Stuart Grange, Minsu Kim
Impact of lockdown on air pollution in Switzerland and across Europe focusing on classical air pollutants $\text{NO}_x$, PM, $\text{O}_3$

Measurements:
- In situ data from Swiss & European air quality monitoring networks
- TROPOMI $\text{NO}_2$ satellite observations

Methods:
- Separate effects due to COVID-19/emissions from effects due to meteorology
  - Filtering satellite data for specific weather situations
  - Machine learning: train model with past data, predict current situation, analyze differences prediction – observations
- Mapping of satellite and in situ $\text{NO}_2$ data onto hourly 100 m x 100 m resolution maps using ML, spatial proxies and meteorological data

https://empa-interim.github.io/empa.interim/swiss_air_quality_and_covid_19.html
Grange et al., 2018 (https://doi.org/10.5194/acp-18-6223-2018)
Expected results and applications

- Temporal and spatial evolution of air pollution in relation to lockdown measures
- Rigorous correction for meteorological effects
- Assessing impact on air pollution exposure
- Assessing impact on CO$_2$ emissions
- Real-world «lab experiment» for atmospheric chemistry
Earth observations used and needed

Used:
- NO$_2$ vertical columns from TROPOMI

Not used:
- Other air pollutants such as CO, SO$_2$, AOD/PM

Needed:
- Better aerosol observations (multiangle, polarimetric)
- Better tropospheric O$_3$ observations
- Better spectral surface reflectance/BRDF data
- Spatial resolution!