Detection Of Cloud Condensation Nuclei Using Multiple Products From A Single Instrument - Sentinel-5P Case Study

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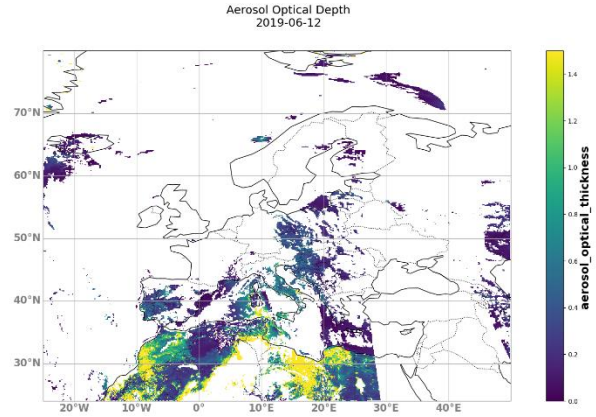
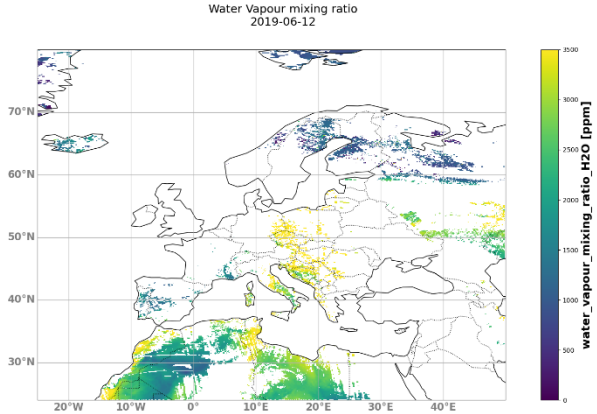
Motivation & Methodology

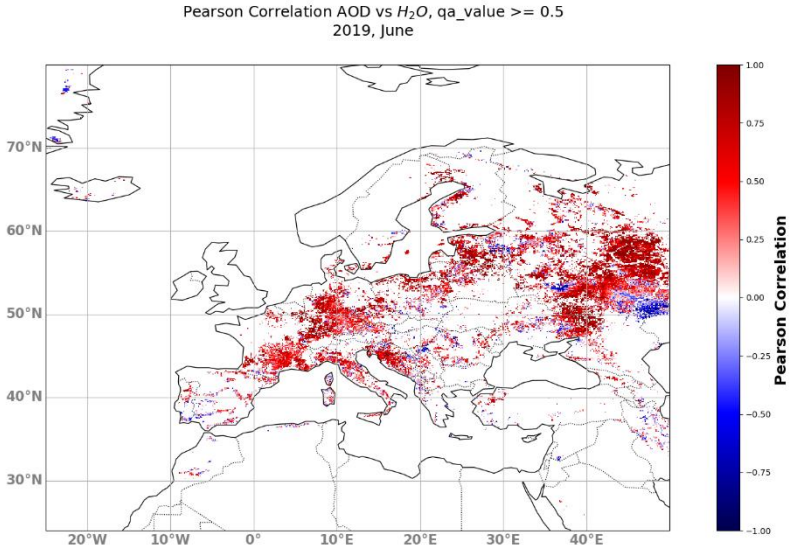
- Feasibility study that uses a single instrument to detect cloud condensation nuclei
- Innovation (H_2O, pres. 3.1.1 & 3.1.2; and AOD, pres. 4.3.6 & 4.3.7) and operational products (AI, ALH, CF) are considered in this study
- Innovation H_2O:
  - SWIR sensor (7 x 7 km)
  - Algorithm based on Leicester Full Physics
  - Land coverage
- Innovation AOD
  - UV-VIS sensor (3.5 x 5.5 km)
  - OMI heritage
  - 5 wavelengths (340, 380, 416, 440, **494 nm**)
  - Cloud free scenes
- Time frame: March – October 2019
- ROI: Europe [24º – 80º Lat; -25º – 50º Lon]

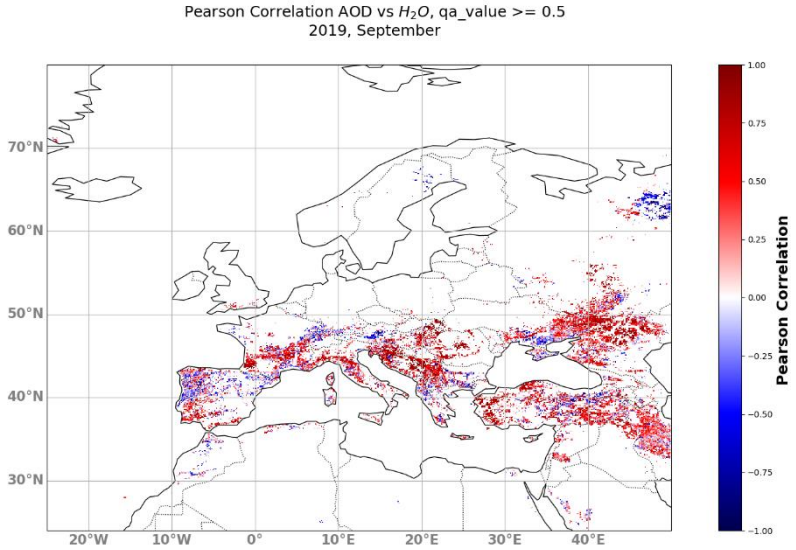
Daily re-gridding to 0.1 x 0.1 degrees of both datasets

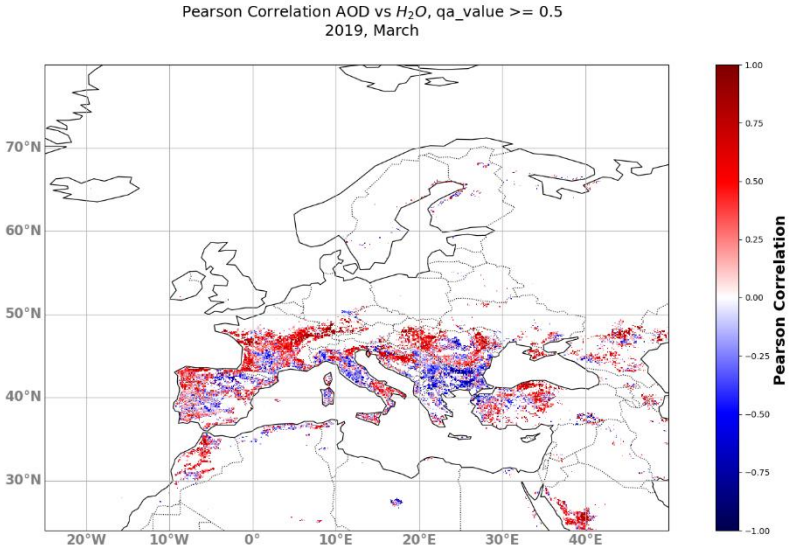




- Quality assured filters (qa_value > 0.5) according to each of the product's ATBD
- Monthly and weekly maps with the Pearson correlation coefficient for the interested ROI; each pixel needs to have at least 5 measurements from both products in the same days
- Examples of March, June, and September 2019; Monthly correlations between water vapour mixing ratio and AOD (494 nm) show almost nominal values (central Europe) but also negative correlations

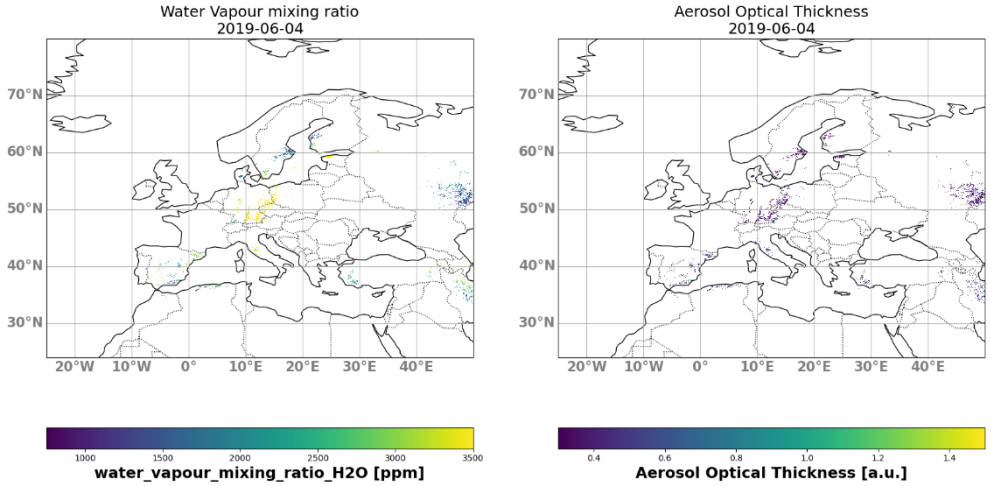


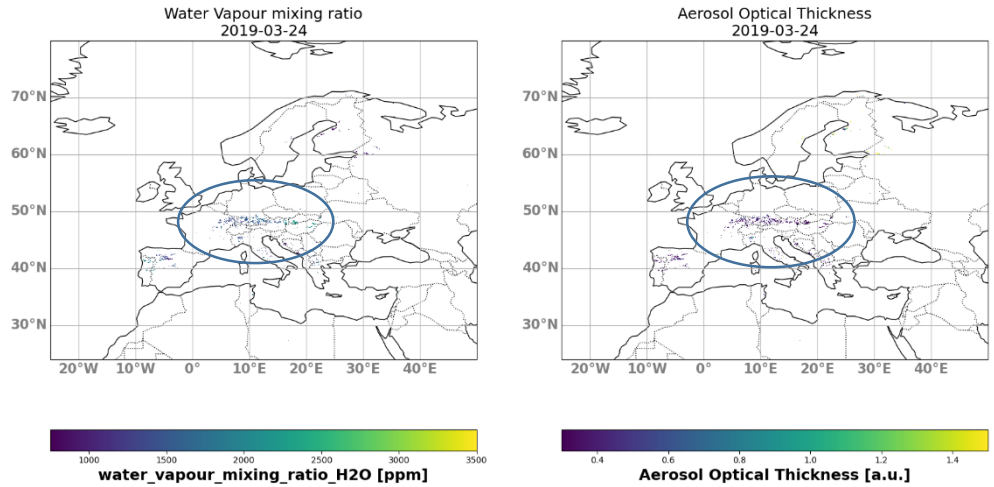




Results, Conclusion & Future steps

- High correlation -> hygroscopic particles
  - Include information on AI, AE
  - Threshold on water vapour and AOD values
- Daily plots on data only with AOD > 0.3 and WV > 750 ppm
- Validation on cloud formation after Tropomi sensing time
  - Other satellite, e.g. S1
  - Ground based, e.g. ceilometers, photometers





- Define empirical values for WV, AOD, AI that indicates presence of CCN
- Quasi-operational procedure
- Suitable for upcoming missions, S4 + S5