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Editorial

Special Issue Atmospheric Composition and Cloud Cover Observations

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A Special Issue of *Atmosphere*, "*Atmospheric Composition and Cloud Cover Observations*", is focused on presenting some of the latest results of observations of clouds and atmospheric composition, mainly by referring to new equipment or experimental set-ups. The seven articles describe observational results using remote sensing and in situ methods that observe cloud cover and/or atmospheric composition, and means of using modelling for evaluating the state of the *Atmosphere* at local, regional, or global scale for various time periods. Most articles focused on observing the atmospheric composition (four), one describes a possibility for obtaining information about cloud cover as a by-product of cameras, one compares model and observational results for some meteorological parameters, and the remaining one analyzes a relatively rare but damaging meteorological hazard.

The diurnal and day-to-day variability of some atmospheric constituents (NO_x, SO_2, CO, O_3, CH_4) during winter, around the capital of Romania, Bucharest, was investigated in Marin et al. [1] using in-situ observations. Differences between work days and weekends were identified. They have also linked the concentration of some air pollutants with some hot spots, using coincident meteorological (mainly wind) data. They conclude that SO_2 may be transported at long distances, while CO and NO_x mainly originate in relatively close traffic hot spots and residential heating. Another important finding is that, locally, air quality is good for the European standards.

The aerosol composition over Europe between 2008 and 2018 and the dependence on atmospheric circulation types were analyzed by Nicolae et al. [2] using EARLINET and AERONET databases. They showed that smoke and dust particles are predominant in Europe in most years and that there is no clear seasonal dependence, but there is a significant variation with the year which can most likely be associated with various circulation patterns. They also analyzed the spatial distribution over the continent in an attempt to identify whether there is any trend in the aerosol composition and/or variability.

Results of the Weather Research and Forecasting (WRF) model were discussed by Roșu et al. [3] in connection with observational data collected by a lidar platform, photometer and meteorological instruments at a local site. These helped in evaluating the performance of simulating the Planetary Boundary Layer Height (PBLH), temperature, wind speed, pressure at the surface and total precipitable water vapor. They found that the model performed relatively well in most cases and that differences from measured parameters are not uncommon.

Effects of biomass burning (mostly wildfires) on the atmospheric composition were described by Guo et al. [4], using remote sensing data from Aqua MODIS (MODerate-resolution Imaging Spectroradiometer). These were combined with CO_2 results from the OCO-2 model, which uses results of the Orbiting Carbon Observatory-2, which helped in identifying advantages and disadvantages of the model. They conclude that OCO-2 is a useful tool for fire-emission monitoring and needs to be used at a larger scale for better management of wildfire effects on atmospheric composition.

Occurrence and climatology of an unpleasant meteorological hazard that may cause important perturbations and damages, the freezing rain, was examined by Andrei et al. [5].

Citation: Voiculescu, M. Special Issue Atmospheric Composition and Cloud Cover Observations. *Atmosphere* **2021**, *12*, 56. https://doi.org/10.3390/atmos12010056

Received: 23 December 2020
Accepted: 30 December 2020
Published: 31 December 2020

They used reanalysis ERA5 data and radiosonde observations for analyzing a particular case in the SE of Europe, but also for building a climatology of these events. They concluded that specific synoptic circulation patterns, involving Scandinavian or Siberian anticyclones, together with a yet unclear role of the Carpathians, significantly increase the probability that rain freezing events occur in Romania.

Observational characteristics of cloud cover at a local site in France are described by Baray et al. [6], who describe an algorithm developed for calculating cloud occurrence frequency using images of an automatic camera. The climatology of frequency occurrence is compared with larger scale products derived from reanalysis and remote sensing, with good results in terms of diurnal and seasonal variability. Absolute values of cloud frequency are less accurate; however, the authors make a good case for using camera images in areas with no cloud instrumentation.

The most recent article provides a multi-instrumental analysis of a dust outbreak over a European region. Ajtai et al. [7] combine remote data from a sun photometer and lidar with in situ measurements of a particle counter and HYSPLIT trajectory analysis, in order to identify the Saharan origin of the dust event observed locally at a site in the SE of Europe. The article concludes that continuous monitoring over larger areas helps in forecasting and managing such hazardous events, which are not rare and occur in all seasons.

Funding: This research received no external funding.

Acknowledgments: Thanks are expressed to the authors for their contributions.

Conflicts of Interest: The author of this editorial declares no conflict of interest.

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