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Editorial

Lower Atmosphere Meteorology

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The *Atmosphere* Special Issue "Lower Atmosphere Meteorology" comprises thirteen original papers dealing with different meteorological processes that occur in the layer of the atmosphere close to the surface and which can greatly affect living beings and materials. This issue was conceived because of the key role that the lower atmosphere plays in that intensive interaction.

This special issue is made up of three groups of papers. The first group focuses on three meteorological variables. One is the mixing layer height, which is an important parameter vis-à-vis gaining a better understanding of the processes involved in air pollution, climate, and weather. This layer is not usually measured and must be calculated and compared with experimental values. The second variable is wind speed, which is one of the most important parameters used as an indicator of changes in atmospheric circulation. The third variable is the air parcel trajectory for estimating atmospheric transport pathways. This is an important tool for obtaining a better understanding of processes within the lower atmosphere.

The mixing layer height's influence on pollutant dispersion is noticeable in urban areas. In this issue, Danchovski [1] evaluated the algorithms used to calculate this variable based on radiosonde and ceilometer data, and a comparison between the procedures was made. The atmospheric boundary layer plays an important role in the study of meteorology and when modelling the weather. Turbulence mixing in the atmosphere near the surface is determined by the height of the atmospheric boundary layer and data remains scarce in hurricane conditions. Under such extreme conditions, Ren et al. [2] investigated the asymmetric distribution of atmospheric boundary layer height scales using dropsondes.

Meteorological parameters are subject to variations as a consequence of atmospheric turbulence. Daily evolution in the surface wind was analysed by Zhao et al. [3], considering observation data from a noticeable spatial and temporal extension. They found large diurnal variations in surface wind and significant regional features. Maruhaashi et al. [4] addressed the topic of mountain waves caused by disturbance in the air flow around a topographic obstacle. They categorized the severity of the wind shear into classes based on airborne observations from two flights and forecasts of a model considering the Froude number and turbulent indicators.

The dispersion and transport of gases and particles in the atmosphere is characterised by important parameters, such as temperature, precipitation, and wind direction and speed. Transport may have a major impact on living beings and materials when toxic substances are released. Analysis of air mass trajectories improves the response so as to minimize the environmental impact of harmful releases into the atmosphere. Air parcel trajectory models prove particularly useful in these situations. This issue presents one study carried out by Hernández-Ceballos et al. [5], who investigated areas probably affected by air masses of hazardous materials released into the atmosphere. Long-term forward trajectories, with the corresponding end-point positions and density maps, were used to show the influence of orography and height release on the dispersion and transport of materials in the atmosphere.

The content in this group is expanded taking into account that meteorological variables together with additional factors can be used to establish suitable environments for human settlements. This

object was quantitatively evaluated and analysed in this issue by Song et al. [6]. The superposition of six key natural factors, including temperature–humidity index and land surface–temperature index, was considered. Results were expressed in levels as a function of the most suitable pattern. Topography and vegetation were the dominant factors while for the perspective of time the dominant factors were temperature and water resource.

Characterizing vegetation also plays an important role in modelling the atmospheric processes involved in climate simulations. The research carried out by Jiménez et al. [7] contributes further in this matter. Remote sensing was used to obtain the nearest different vegetation index database which represents vegetation in land surface models. Three methods were considered to derive the fractional vegetation cover assessing the impact of this parameter on near-surface temperature.

The second group of papers considers aerosols, clouds, and precipitation. Intensive research has been devoted in recent years to aerosols due to their influence on radiative processes and on human health. Moreover, aerosols may be cloud condensation nuclei. Atmospheric optics is represented by the analysis carried out by Zhang et al. [8], where aerosol optical depth evolution was investigated together with the determination of the volume size distribution. In this issue, the paper by Wang et al. [9] presents the seasonal and interannual variation of low-cloud fraction and some of its meteorological controlling factors such as the estimated inversion strength and sea surface temperature by means of a long-term database.

Precipitation is represented by the analysis made by Gao et al. [10], where several cycles were determined in a temporal analysis and two patterns in spatial analysis. The relationship between the diurnal variations of clouds and precipitation was also considered.

Persistent rain in a subtropical monsoon region is a complex process that demands in-depth research. The results obtained by Zhu et al. [11] are included in this issue. These authors studied the spatiotemporal variations of the Plum Rains and the influencing factors on different time scales that have thus far scarcely been considered in this perspective.

The final set of papers addresses fundamental features of gases in the atmosphere and anthropogenic greenhouse emission estimates whose concentration and evolution are measured worldwide. Trace gases retrieved using ground-based remote sensing instruments are presented in Javed et al. [12], who discuss the relationship between NO_2 and CHOCHO with different meteorological parameters and show the significant decreasing trend of these trace gases in the afternoon. Huang et al. [13] analysed a correlation "top-down" procedure to estimate anthropogenic CH_4 emission using long-term atmospheric CH_4 and CO_2 concentration data. Moreover, the results were compared with the frequent "bottom-up" IPCC inventory procedure.

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