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Editorial

Special Issue: 10th Anniversary of Atmosphere: Climatology and Meteorology

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During the last decade, the number of open access science journals has increased, and these have become an avenue for publishing quality science in a relatively fast and economical way. The Multidisciplinary Digital Publishing Institute (MDPI) journal *Atmosphere* published its first volume in 2010, and recently celebrated 10 years with the publication of this special commemorative issue. *Atmosphere* is a peer reviewed, open access journal described as cross disciplinary [1]. Furthermore, the journal attracts authorship from across the globe. During the first few years, the regular issue of *Atmosphere* was a quarterly publication, but, by 2019, was issued each month. The journal publishes research articles and notes, communications, review articles, and case studies, as well as timely Special Issues.

The structure of *Atmosphere* now reflects the fact that the journal attracts a large number of citations from a diverse number of topics across the discipline of atmospheric and related sciences. More information about the journal can be found at [1], but some key points will be described here. The journal has one chief editor, but there are 11 broad subject areas, each with their own section editor. Additionally, there is an advisory board of 10 prominent scientists, as well as a strong editorial review board.

One measure of journal quality is the acceptance/rejection rates of submitted articles, since this can be an indicator of the quality of the submitted articles and the rigor of the review process. There are many websites which show these rates for various journals in the field, but a peer-review study of acceptance rates for 47 publications in atmospheric sciences [2] demonstrated that more than three-quarters of these had acceptance rates of 40–75%. According to the 2020 Annual Report for *Atmosphere* [3], this rate has varied between 42 and 55 percent over the last five years, which is consistent with the peer review study cited above.

This editorial will summarize some relevant data highlighting the growth and quality of *Atmosphere*, as well as the 18 contributions that were published as part of the 10th Anniversary Special Issue.

The information discussed here about *Atmosphere* can be found in [1,3–5]. The first issue of *Atmosphere* was released in December 2010. The journal had published more than 1000 articles by the end of 2019, and the meteorology and climatology section has published more than 400 of these. The first impact factor for *Atmosphere* was issued in 2014, and the impact factor has increased steadily [1] to the current value of 2.397, which is number 48 of 93 on the Web of Science InCites Journal Citation Reports (JCR) [4]. On the Scimago Journal and Country Rank (SJR) website [5], which, like JCR, is used often by academic institutions as an indicator of the strength of publications, *Atmosphere* is number 62 (0.698 SJR Index) of 125 journals in the atmospheric science section under the heading of Earth and Planetary Sciences for 2019. The total citations and the citations per document have increased steadily in the last five years. The journal also ranks in the top half of the listed journals ranked on [5] using the Hirsch (h-) index.

The 10th Anniversary Special Issue featured 18 peer-reviewed papers that could be categorized broadly into four topical areas, (a) societal impacts and modelling, (b) sub-seasonal and seasonal climate variability, (c) synoptic meteorology and case studies, and (d) instrumentation and operational techniques.

The first topic area included three articles [6–8], and all of these concerned the effect of extreme temperatures on human populations. It is well known that extreme heat, especially at night, is detrimental to human health. In [6], the authors examine the heat health warning system (HHWS) in Germany, which is designed to be preventative and proactive. This system has been in place since 2005, and [6] examines the system efficacy and updates. The system is automated and ingests forecast data, but human forecasters can adjust the warnings. Since 2005, an analysis of the heat warnings in four cities has shown no trend, but does show variability consistent with severe heat waves. The HHWS has shown to be effective in terms of statistically significant reductions in heat related health emergencies.

Then, [7] examined time series of heat and cold attributable deaths for two cities in Portugal and developed a model to project the future trends in mortality for near-term (2046–2065) and long-term (2080–2099) climate projections. During the two decades covering 1986–2005, more deaths were noted in winter than in summer in both cities. The key results showed that since cold deaths are overwhelmingly more prevalent than heat deaths in both cities, the overall mortality rate due to temperature is reduced for both the near-term and long-term simulations. This reduction is due to warmer winters leading to decreased cold deaths. The number of heat deaths increases for both future scenarios in summer and winter. The same authors [8] follow their work in [7], and evaluated who was at risk with respect to age (those under 65 versus those older than 65). For one city, the mortality rate for the over 65 group was higher than that for the under 65 group, but both showed increases. In the other city, only the over 65 group showed an increase in mortality.

The second topic area included seven articles [9–15] and covered a diverse number of phenomena related to extremes and teleconnections that generally operated on sub-seasonal and seasonal time scales. The sediment discharge in the Amazon Basin [9] was examined and modelled using in situ and satellite derived information in the river sediment discharge for Amazonia (RSDA) model. The study ultimately covered the period from 1859–2015. They [9] found an increased sediment discharge across the Amazon basin due to stronger singular rainfall events and/or changes in land cover after 1931. Before that period, wet season rainfall and sedimentation showed interdecadal variability, but little trend. After that date, increases in both variables occurred, but more rapidly since the 1990s. While [9] was a longer-term study, [15] was a short-term study (2011–2017) of the interannual variability of the seasonal extent of the North American Monsoon (NAM). The NAM is a period of rainfall in the US southwestern states associated with strong thunderstorm-generated rainfall. They showed that the late part of the warm season (1 April–30 September) was associated with higher dewpoints, and thus the greatest portion of annual rainfall for every year except 2016, which is characteristic of southeast Asian monsoons. The year 2016 was different in that precipitation was more evenly distributed throughout the year.

The work of [10] examined the climatological character of the tilt in the North Atlantic oscillation (NAO) dipole and the correlation with synoptic weather. They examined the frequency of positive (southwest–northeast), neutral (south–north), and negatively (northwest-southeast) tilted dipoles over the Atlantic from 1950–2011. The surface temperature anomalies (STA) typically had an associated quadrupole structure that correlated to each NAO dipole tilt, which then had an influence on the temperature advection patterns as well. The underlying sea surface temperatures (SSTs) were a significant driver of the NAO tilting events. During the negative NAO epoch (1950–1980), almost 60% of the NAO dipoles were negatively tilted, while during the positive NAO epoch (1981–2010), the positive and negative NAO tilt events were evenly distributed. The atmospheric mechanisms causing the tilts were explored as well.

The influence of El Niño and southern oscillation (ENSO) on regional and seasonal rainfall patterns is a common type of climatological study (e.g., [11,14]). First, [11] examined the atmospheric structure associated with the three strongest El Niño events (1983, 1998, and 2016) from 1950–2016, as well as the similarities and differences between January to April rainfall patterns and moisture transport over the Eastern Pacific and tropical Andes (Peru and Ecuador). They found that there was a difference between the low-level moisture flux between the 1983 and 1998 events versus that of 2016. In the former two events, low level moisture transport from the Pacific was blocked, and the equatorward portion for the study region was anomalously wet, while the poleward region was dry. During the 2016 event, low-level moisture advection from the Amazon region and convection east of the Andes may have contributed to subsidence and dryness over the whole study region. Then, [14] examined the influence of ENSO and the Indian Ocean dipole (IOD) on the monsoonal rainfall patterns for Ethiopia. They used 17 stations, but due to missing data and changes in instrumentation, the rainfall from 1981–2006 was studied. This region showed strong ENSO modulated variability in the precipitation (dry in El Niño years, wet in La Niña years). They further demonstrated that the IOD influences the regional precipitation independently, and their combined influence needs to be considered to forecast monsoon season precipitation.

The association of natural hazards with persistent weather types occurring over the British Isles in the late 20th century was studied in [12], and this information was then used to determine whether or not these natural hazards would become more common by 2100. This work successfully showed that weather types or analogues are a useful way to project what kind of changes in hazardous weather may occur at the end of the 21st century in different climate change scenarios. For example, more persistent summer season weather types, especially those linked to poor air quality, drought, and heatwaves were noted by the year 2100. This work also shows a decrease in the weather types associated with fall season heavy rainfalls. In a similar study, [13] examined the teleconnections derived from three different commonly used reanalyses and their influence on winter season STAs over southern China. A few of these teleconnection patterns were associated with a linear influence (positive teleconnection sign–negative STA, and vice versa). While [12] examined future climate scenarios, [13] demonstrated that some of these teleconnection–STA associations showed promise for use in sub-seasonal forecasting (one-to-three-week time frame) for southern China.

The topic area, synoptic meteorology and case studies, features four contributions [16–19], the first of which examines a late season blizzard in Romania during 19–22 April, 2017 [16]. This storm was problematic because this occurred late in the spring season and the arctic air following the event impacted regional vegetation. The European Centre for Medium Range Forecasts (ECMWF) ERA-Interim reanalysis data set was used along with Meteosat imagery for the synoptic analysis. The regional climate model RegCM4.5 (which uses the Mesocale model version 5 (MM5) as the core) was used for model sensitivity analysis. This blizzard occurred in conjunction with a rapidly developing cyclone in the western Black Sea. The synoptic and sensitivity studies demonstrated that this cyclone developed due to the influence of enhanced upper-level forcing associated with jet streak interaction and increased low-level baroclinicity as a low-level jet strengthened in concert with SST gradients. A conceptual model was developed for late season snow events impacting this region, and the coupled upper-level jets, well known for coastal developments, were found to be the difference between extreme cyclone development and more typical events in the Romania region.

Another study [17] used data collected during a field campaign from 28 June–3 July 2015 in order to examine the diurnal cycle of rainfall in the coastal tropical and mountainous region of the central part of Veracruz State in Mexico. This region is characterized by strongly sloped topography. This work [17] found that in the absence of large-scale phenomena, the trade winds are critical for supplying moisture to the region, and hence the topography contributes to the timing of localized rainfall between 16:00–19:00 LST in the mountainous regions and later (22:00–01:00 LST) in the plains. The interactions between the topography and land–sea or mountain breeze circulations are helpful in synchronizing the timing. A field study [19] was performed during the 21 August 2017 solar eclipse over North America and the report is given here. In central Virginia, the Blue Ridge Mountains experienced a partial eclipse. A combination of weather stations, tethered balloons, and Doppler lidar instruments was deployed in a valley approximately 25 km northwest of Charlottesville. On the day of the eclipse, the study region was dominated by high pressure. During the eclipse, a shallow layer of cooling was noted and a mountain breeze circulation similar to what was expected during the night developed, and this remained until the eclipse was finished. Additionally, surface wind directions were modified as expected for the deployed stations, consistent with expected conceptual models.

One study [18], investigated a Mediterranean tropical-like cyclone (TLC), which are more colloquially called "medicanes", that affected Sicily during 7–8 November 2014. This type of storm has similarities to tropical cyclones, but there are significant differences as well. For example, these TLCs begin as baroclinic storms and respond to SSTs lower than those associated with their tropical counterparts, but later in their lifecycle are warm core and driven significantly by diabatic processes. This study [18] used the weather research and forecasting (WRF) model in order to downscale the ERA-5 re-analyses to 4 km using 17 different model physics and parameterization configurations. They found that most of these successfully rendered the 7–8 November 2014 TLC in terms of the path and the transformation from a baroclinic system to a sub-tropical cyclone. There were some differences as well.

Four articles were published that involved the use of instruments or the evaluation or development of operational techniques [20–23]. The work of [20] examined the parameterization equations for the detection of lightning for storms occurring in the state of Alabama in the U.S.A. They found three sources of errors in lightning parameterizations: conceptual model errors, insufficient observations, and poor statistics. Lightning flash rates can be used in forecasting applications, especially for nowcasting high-impact convective-type weather. Among the several conclusions of this work was the conclusion that this type of study should be repeated in different locations in order to improve lightning detection algorithms. However, work is continuing to improve the detection and calculation of electromagnetic fields using the equations of electromagnetic fields generated by moving or accelerating charges [23]. These can be used to evaluate the electromagnetic fields from lightning return strokes. The authors [23] derived equations to calculate electromagnetic fields using the charge acceleration equations, which can be written in terms of current density and velocity or just in terms of the former. These may have applications to eventually improve lightning detection.

Many techniques have been developed in order to improve upon the detection and quantification of hazardous and extreme weather. The Bora wind [21] is a strong downslope wind observed in the lee of the Alps along the Adriatic Sea coast. This wind can cause economic damage and poses a risk to human safety in southwest Slovenia [21]. The authors collected wind data from a wind turbine site in an area where this downslope wind is common. They used the wind profile laws in boundary layer meteorology and engineering to develop a site-specific model based on six Bora wind events that occured over a 13-month period from April 2010–May 2011. Strong straight-line wind events are also generated by convective events. Downdrafts that resulted from strong elevated convection might be strong enough to penetrate the cold layer that occurred in association with the convection developing within warm air that overrun this layer [22]. Elevated convection occurs commonly over the eastern two thirds of the U.S.A. They [22] used a 10-year period and developed a tool that is calculated using the ratio of downdraft convective available potential energy (DCAPE) and downdraft convective inhibition (DCIN) to determine which events will lead to the possibility of severe surface winds. When DCIN/DCAPE is less than 1.0, strong surface winds are possible.

This editorial describes the 10th Anniversary of the MDPI journal *Atmosphere*, which was first issued as a quarterly in late 2010. A brief analysis of the growth in the quality of *Atmosphere* demonstrates that it has become established as a journal that attracts scientific manuscripts due to the strong performance in measures of quality and academic rigor (acceptance rate). *Atmosphere*, like many open access publications, also has a relatively fast time from submission to first decision (approximately two to three weeks) [1], as well as publication costs that are consistent with other open access publications.

The 10th Anniversary Special Issue attracted articles from institutions across the globe, highlighting the most recent research in areas such as societal impacts and modelling, sub-seasonal and seasonal climate variability, synoptic meteorology and case studies, and instrumentation and operational techniques. These 18 contributions are examples of the kind of research that can be found routinely in *Atmosphere*.

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