

## Interdisciplinary Research in Meteorological Sciences

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Advance Research in Meteorological Sciences (ARMS), is a broad-based journal founded on two key tenets: to publish exciting research with respect to the subjects of Environmental & Atmospheric Sciences and to provide a rapid turn-around time possible for reviewing and publishing and to disseminate the articles freely for research, teaching, and reference purposes. Why are people, such as the author team above, none of whom are classically trained in meteorological sciences, interested in Advance Research in Meteorological Sciences? Meteorological science is a prerequisite discipline for much of the interdisciplinary research focused on addressing perhaps the biggest societal challenge of our day: anthropogenically driven global climate change. The disciplines of environmental and atmospheric science are in themselves multi-disciplinary. How we mitigate, how we adapt to, how we communicate, how we perceive, and how we measure, monitor, and model/forecasts past and/or future events all relates to other disciplines such as economics, business, communication, and history; not to mention the other social and health sciences as well as a multitude of natural scientific issues. Humans and our relations to us and our planet is the key. Many of us start and end the day hearing about the weather - in some media told by people who are not trained in meteorology themselves.

Our exposure to weather leads us to believe that we might understand it, or understand how to react to it. When meteorological studies are conducted with the purpose of advancing our understanding of global change they are of clear importance to other disciplines and to society at large. However, one of the major impediments to the advancement of knowledge is the lack of publication outlets for open, interdisciplinary, yet rigorous studies in meteorology. As a member of the editorial board of ARMS the lead author supports the tenets of this new journal. The author team is an example of colleagues who might not normally work together, a majority of whom are not atmospheric scientists; all of us working for the common goal of improving our future.

*"In nearly all domains of Global Change Research (GCR), the role of humans is a key factor as a driving force, a subject of impacts, or an agent in mitigating impacts and adapting to change...GCR studies must involve from their outset the social, human, natural and technical sciences in creating the spaces of interdisciplinarity, its terms of reference and forms of articulation" [1].*

Climate change is a complex and topical phenomenon; a composite of mixed origins, studied, discussed, disputed, and explored from various perspectives resulting in an incessantly expanding web of information, data sets, actors and knowledge systems authorities [2,3]. Despite the complexity of the field of climate change, there is nonetheless core agreement among a majority of climate scientists that the climate is changing and that the phenomenon must be addressed by the world community [4]. Meteorological, environmental, and atmospheric sciences not only impact the scientific community but may also impact public perception. Even though the changing climate can be said to be on the public agenda, it remains a challenge for the public to navigate the landscape of climate change, because of the very complex nature of the field [5]. This suggests that we are faced with the

challenge of communicating the complexity, the vast amount of data, the uncertainties, and the scientific knowledge of climate science in a comprehensible manner [6].

Under the rationale "seeing is believing", visual imagery has long been used to present and demonstrate consequences of environmental change and the scientific information is commonly illustrated in the forms of e.g. charts, maps and diagrams, knowing that these representations are often very abstract and simplified [7] Developments within computing technology provide potentials for improving visualization techniques [7,8] and for communication of what people experience at the local level: the weather and the air quality. As human beings we do not have the sensory capacity to directly perceive abstract phenomena such as global average temperature or global average changes. What we experience is local weather at any given time, which we may relate to (scientifically justifiably or not) conceptions of climate change and human impacts. We lack research and knowledge about how ICT-based visualization affects understanding of problems, goals and action alternatives among different target groups, including the public and thus how weather communication and perception affect climate change communication. We lack an understanding of how our historical understanding and perception of weather and climate can affect our decision making and value systems.

While ARMS can and should have advanced studies related to meteorological phenomena from the micro to global scale, there should also be a focus in ARMS on new applications of interdisciplinary meteorological sciences.

One example gaining importance, especially for our future monitoring and communications efforts is space and planetary environment weather. While the term "space weather" brings to mind distant events occurring far away from the traditional terrestrial domain, the ability to understand, predict and communicate about space weather is becoming nothing less than critically important. How does space weather, the closest of which is generated by solar events occurring 150 million kilometers distant, impact modern human existence [9]? Space weather effects can interrupt or even permanently damage satellites. This can occur due to penetration of energetic particles impacting the electronic components deep inside a satellite, resulting in erroneous commands, or cause damage to important sub-systems, such as star imagers required for accurate satellite orientation [10]. The thousands of satellites - enabling our modern global lifestyle

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and providing services such as global positioning (critical now to nearly all global air transportation and shipping), communications (mobile phone and internet), and earth observation (including, among a multitude of others, terrestrial weather monitoring, earth observation, and search and rescue systems) - are not easily repaired should a software controller or satellite orientation component fail. In fact, the number of human activities which are intricately linked with orbital operations is ubiquitous and growing. For example, even ATM operations increasingly utilize satellite communications to verify account status across the globe as a precursor to completing a transaction [11]. With regard to more direct effects, energetic space weather events can deliver harmful quantities of radiation to astronauts and even passengers in trans-oceanic airline flight when those flight paths transit the higher latitudes [10]. Further, the consequences of space weather events are not only felt in the industrialized west. Across much of the developing world, due to a lack of infrastructure, reliance on satellite communication services is perhaps even more critical. From micro-meteorological phenomena to space, from historical to future prediction, the need and importance for interdisciplinary research in meteorological sciences will only grow and thus the need for an open outlet for results.

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