

*Editorial*

## **Climate—A New Open Access Journal Covering the Complex, Multi-Disciplinary Climate Research Challenge**

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Climate has changed over the Earth's past, is changing continuously and will do so in the future due to external and internal drivers. Some external drivers, such as the astronomic constellation of the Earth-sun system and continental shifts, have led to slow changes over long time scales. While others, for instance volcanic eruptions, may lead to fast, quasi-abrupt changes with impacts on climate over a limited time. Internal drivers like albedo, or the greenhouse effect are parts and processes of the climate system itself that may again change the climate at comparatively shorter time scales than most external drivers.

Over the lifetime of the Earth's atmosphere, the atmospheric composition has changed because life developed, first in the oceans and then on land. The atmospheric composition also changes in dependency of the planet temperature states because e.g. chemical reactions or uptake/release of CO<sub>2</sub> and of other trace gases are temperature dependent. These changes occurred over long timescales and hence permitted adaptation. The onset of the industrial revolution, and later the introduction of filters, scrubbers and air-quality regulations, however, led to changes in the atmospheric composition over relatively short timescales.

Any changes in the atmospheric composition are climate relevant as airborne particles and so-called greenhouse gases affect the incoming solar radiation. So-called precursor gases play a role for secondary pollution and gas-to-particle formation. All kinds of hygroscopic particles may affect cloud and precipitation formation and cloud lifetime. Such indirect, semi-direct and direct aerosol effects influence the water and energy cycle and, via feedbacks in soil, vegetation and biogenic emissions, the trace gas cycle.

The multidisciplinary nature of climate is truly astounding, with its implications for healthy air, water and energy that are pre-requisites for life, food production and the quality of life. This means that climate does not only affect the environment we live in it also affects many other fields important in our lives such as economics and politics. Thus, the aforementioned rapid changes in the atmospheric composition over the last century and their consequences for humankind in so many aspects, place an

urgent need for comprehensive process orientated climate research. Given the complexity of the climatic responses to the internal and external driving mechanisms and of the interactions of processes, humankind namely has to adapt to climate conditions to satisfy the needs of a growing world population. To achieve this goal, it is essential to be able to forecast climate not just on the scale of El Niño.

Adaptation requires understanding the bio-geophysical and geochemical processes of climate, and climate variability on seasonal, interannual and decadal scales. This means we have to examine climate and its relevant processes from different perspectives. This task requires the efforts of the entire climate community. However, such comprehensive, multidisciplinary approaches can sometimes create seemingly contra-dictionary results that lead to more questions than answers. While in such multi-disciplinary, collaborative research, it initially may be difficult to develop a universal, widely accepted theory, each contribution is a piece of the climate puzzle. It may take years to realize that initially contradicting results were just special cases. For instance, a pencil is sharp and writes when looked at from one end, but on the rubber end, it is smooth and erases. Looking from the side view reveals a clearer picture. Therefore, rather than spending efforts on battles over seemingly contra-dictionary results, we should take these results as potential indicators for still missing processes and links, and focus our efforts on unveiling them.

The journal *Climate* is intended to facilitate understanding the climate system, how climate evolves and to help to adapt to climate challenges. As an international and multidisciplinary scholarly journal, *Climate* focuses on process modeling and observational studies related to climate on all scales. This focus includes, but is not limited to, land-atmosphere interactions and land cover changes, the role of natural aerosols in the climate system, interaction between the trace gas-, water- and energy-cycle, stratosphere-troposphere coupling, and ocean-atmosphere interaction. For climate adaptation, understanding of short-term extreme events (e.g. tropical cyclones, severe storms, droughts, heat-waves) in past, present and future climate, and dynamics at all scales (e.g. turbulence, monsoon, general circulation) are key elements. Special interest is on interseasonal, interannual to decadal climate variability and climate change, including studies on the impacts of climate on human health, sports performance, water resources, food production, sustainability, energy and consumption, just to mention a few. Such climate impact assessment also may include policy and strategies like green growth and carbon markets, climate change adaptation and its relation to disaster risk reduction and disaster education.

In all this, quantifying uncertainty and separating the anthropogenic and natural climate signals are important. The challenges of climate impacts and the large range of climate scales require the development of new methods to use unconventional data (e.g. satellite remote sensing) for climate-model evaluation and/or improvement or climate analysis, as well as new statistical methods for analysis of climatology.

*Climate* will publish special issues dedicated to various aspects of the climate. Several special issues are already planned that will help define *Climate*. The breadth of the expertise of the members serving on the editorial board guarantees the assignment of expert reviewers and hence high quality articles. All articles are subject to a rigorous peer-review process before published online. The editorial board and production office strive to achieve the shortest possible turnaround. This pledge, and the fact

that *Climate* is an open access journal, allow quick access to the newest findings in climate sciences to a wide readership and will help humankind to face the challenges of, and adapt to, climate changes.

The editorial board, production office and I foresee that *Climate* will become a first-class, go-to journal for multidisciplinary climate research worldwide that advances the understanding of climate and helps facing climate challenges for the better of the world. We are looking forward to receiving your contributions.

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