Why is fog important?

Fog is commonplace in many coastal geographies, notably the west coasts of California, Chile, and Africa. In many Pacific coastal systems, fog is the primary—sometimes the only—source of water for plant communities and human settlements. It is a fundamental moderator of local and regional climate and influences productivity of near-coast terrestrial ecosystems.

There is a need to study fog as a system in order to be able to predict, model and understand the connections among ocean, atmosphere, and land as well as identify the effects of fog on climate, ecology, agriculture, and human health and well being.

Why an interdisciplinary approach?

Our understanding of the whole-system phenomenon of fog formation, transport, and integration into hydrological and biogeochemical cycles has remained elusive due, in part, to lack of an interdisciplinary approach to the problem. The emphasis of past fog research has been to examine it primarily in terms of physical and chemical processes within disciplinary domains. More recent research is aimed at other aspects of the fog system, including its chemical formation and biological composition as well as deposition and delivery of water, nutrients and microbes to human and natural systems.

Recognizing the need for an interdisciplinary approach to fog research, a diverse group of multidisciplinary scientists was engaged over the course of several meetings to identify gaps in knowledge and fog research frontiers. It was the first time fog researchers have come together to develop an interdisciplinary framework and research agenda through a community-driven planning exercise led by Dr. Kathleen Weathers at the Cary Institute of Ecosystem Studies in collaboration with a steering committee. The research dialogue confirmed the need for an interdisciplinary, systems-based approach and also resulted in a conceptual framework for studying coastal fog as a system.

The fog research community came together to develop an interdisciplinary research agenda and is now poised to collaboratively implement that ambitious agenda.

fog and a changing climate

Changing global and regional climate is already affecting fog frequency and distribution in coastal California. A study of northern California coastal fog occurrence using data going back to the early 1900s found that fog frequency has decreased over the last century.

Understanding how changes in climate affect fog frequency and distribution is an immediate research priority. This will require new tools for studying fog, including the use of paleoclimate proxies of fog presence, improved sensors and monitoring devices, improved satellite technology, and even drones, or UAVs, in addition to traditional aircraft.

UAVs with basic sensors can be sent out into a fog event once it forms, increasing safety and reducing costs of fog data collection efforts.

solving the mysteries of Coastal Fog

an interdisciplinary research approach

Learn more...

The outcome of a one-year research planning exercise is summarized in a white paper: *Fog Research Frontiers: An Interdisciplinary Research Agenda for Coastal Fog Systems*. The report identifies priorities for implementing an interdisciplinary fog research agenda. Immediate actions include collaboratively-initiated research projects and promotion of interdisciplinary research, within and among existing institutions, scientific communities and funding agencies.

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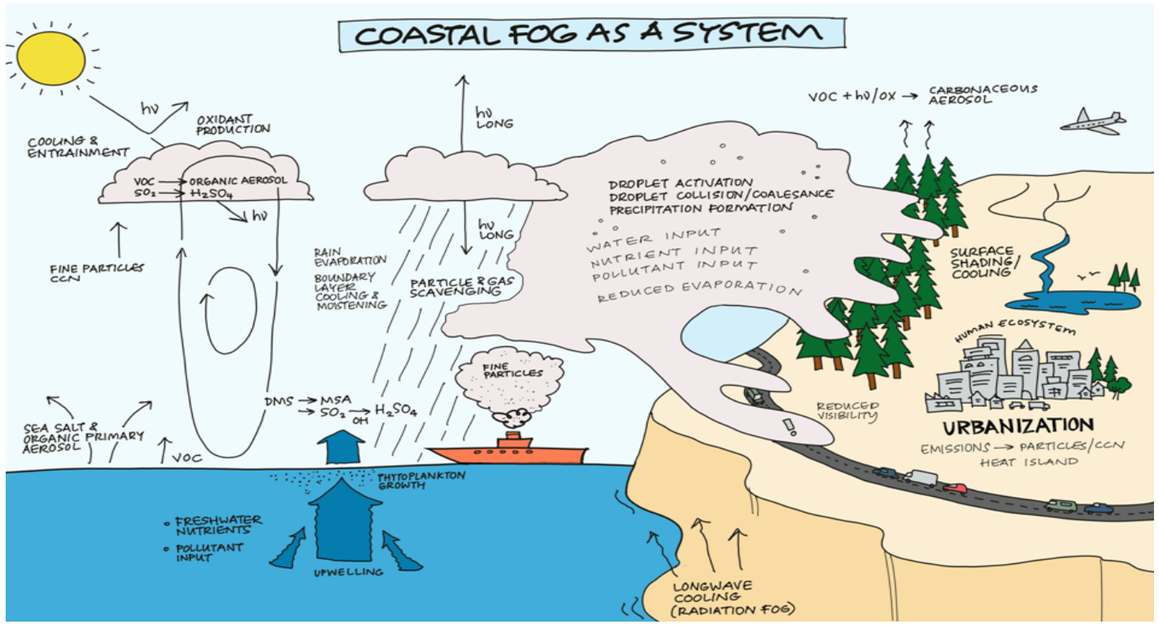
A systems approach is key

A systems approach to fog research not only provides a mechanistic understanding of the controls on fog formation, but also of the feedbacks to its formation, dissipation, and distribution (e.g., the fields of atmospheric and marine physics, biology, and chemistry), flows (movement of fog from ocean to land), and stocks or pools (deposition and distribution within adjacent terrestrial systems). To accomplish this, domain scientists must be catalyzed to work collaboratively toward a common framework and strategic plan that defines an interdisciplinary research agenda.

An emerging field: biology of fog

The discovery that fog supports microbial life raises fundamental questions about its biology. What microbiota lives in fog? Where do these microbes originate and where are they being transported? Do pathogens move from ocean to land via fog?

Because of the possible ramifications for human health, research on fog biology is imperative.



fog

def.

A collection of suspended water droplets or ice crystals near the earth's surface that obscures or restricts visibility to below 1 km (to a greater extent than mist).

Why research fog?

1. Human Health

Fog can be environmentally detrimental, scavenging pollutants from the atmosphere and impacting ecosystem and human health, especially in urban areas affected by fog. Recently, fog has been identified as capable of supporting microbial organisms and serving as a vector for human, plant and animal pathogens.

In foggy cities,such as London and Los Angeles, thousands of excess deaths have been attributed to the presence of acidic fog particles.

2. Agriculture

Fog moderates the local and regional climate, bringing cool nights and foggy mornings that burn off by midday, a maritime effect appreciated by winemakers and farmers in fog-affected coastal regions throughout the world. The impacts of climate change on fog is of great concern in these fog-dependent agricultural areas.

Winter fog days have decreased by 46% in the Central Valley of California since 1981, which is expected to have negative impacts on fruit and nut farming.

3. Biodiversity

Fog is a critical source of water and nutrients in coastal ecosystems such as the redwood and olivillo forests along the Pacific coasts of North and South America. Some plants and animals, including insects, depend on wet fog as a principle source of water, particularly in otherwise desert climes, as along many African coastal areas.

Redwood forests in California receive approximately 30-40% of their moisture from coastal fog.

4. Transportation

The mere presence of fog results in airplane, ship, and automobile traffic delays and accidents costing multiple millions of dollars annually, especially in coastal areas around the world. An improved understanding of coastal fog systems is expected to lead to better forecasting models, among other benefits to stakeholders in the transportation planning and safety fields.

Fog disrupts transportation, creating hazardous conditions and costly traffic delays.

5. Economy

Fog is an integral part of some coastal regions and affects the lives and livelihoods of people living in these areas. The full range of ecosystem services and economic impacts of fog is still poorly understood. For this reason, socio-economic analysis of coastal fog systems is considered an immediate research priority.

Changes in fog occurrence could impact the wine industry, which was valued at $13.4 billion in fog-affected Sonoma County, in 2012.