AOSC Strategic Plan

The mission of the Department of Atmospheric and Oceanic Science (AOSC) is to conduct world-class research and academic training in the physics and chemistry of the atmosphere and ocean and the interactions between these fluids. Specific research foci are chosen to address the cutting edge of environmental research and societal needs, exploiting our unique relationship to our government laboratory partners. A central element of the academic program is our research-oriented PhD degree.

1) Research and Scholarship Priorities

Maintain current excellence

The most recent evaluation of AOSC by the National Research Council ranked AOSC in the middle of the top ten graduate programs in atmospheric and oceanic sciences in the United States. Our ambition is to challenge the few which outrank us. Of critical importance is maintaining the base resources needed to support our core scholarly and teaching commitments in atmospheric and oceanic science. We must also maintain core strengths in our research program, notably atmospheric and oceanic climate variability and change, physics and chemistry of the atmosphere, and our internationally recognized development of analysis tools such as data assimilation, strengths that are synchronized to the needs and resources of the greater Washington DC research laboratories and funding agencies.

New Initiatives

New initiatives leverage our core expertise and our unique relationships. They tackle problems of high scientific importance and societal impact and must be competitive with similar efforts anywhere in the world.

Integrated Earth System Analysis

Revolutions in computer technology, numerical simulation, and observing systems, as well as our developing understanding of physical, biological, and chemical systems have combined to offer the ability to reconstruct the evolving physics, chemistry, and biology of the atmosphere, ocean, land surface, and cryosphere, and the interactions between these systems during the past century. Analysis of the changing climate system will be a core component of the University’s initiative in Environmental Security, and can be a building block in a UMD initiative in environmental high performance computational science. Linking units within CMNS include ESSIC, Chemistry, and MEES. Specific priorities include:

• Biogeochemical Cycles. Key feedbacks within the earth’s climate occur through biogeochemical cycles linking the overlying atmosphere, land surface, and underlying ocean. Building this effort leverages our current expertise and puts us at the heart of scientific debates regarding human impacts on climate and effective mitigation strategies. Will require one additional faculty appointment to lead this initiative.

• Regional climate of the Chesapeake air- and watersheds and regional waters. AOSC already has a strong commitment to research on air quality in service to the State of Maryland through the RAMMPP program, the State Climatologist’s Office, and our regional modeling
initiatives. Capturing the full climate system requires expanding into the ground and marine water systems. Will require one additional faculty appointment to lead this initiative.

- Water’s role in climate and Environmental Security. Water is the critical variable that links environmental issues and human impacts. Droughts and floods impact both the developed and developing world, causing population shifts and exacerbating international conflicts. A growing initiative within AOSC in cryospheric processes acknowledges the importance of polar climate variability and change and the strength of our government laboratory partners in this field. Both are linked to the role that the oceans play in climate variability and change. Will require one-two additional faculty appointments due to the scope of this initiative.

Climate Prediction
Our Integrated Earth System Analysis capability opens up opportunities to extend our capabilities in the area of prediction. Predictive capability has already been developed within the Department in the areas of air pollution and regional climate, including the regional marine environment. Our development of coupled earth system prediction systems will help to trace the influence of weather and climate on related variables such as drought, aerosol distributions, biomass burning, and ocean acidity. The earth system perspective of these coupled models encourages AOSC scientists to explore changes in the earth system on seasonal to decadal timescales, where the impact of climate change on human society could be truly massive. We expect this effort to be integrated within the initiatives outlined above.

2) Graduate and Undergraduate Education

Graduate Closely linked to the AOSC research program, our graduate program produces approximately 10 PhDs per year. Many of our students collaborate with scientists in other departments at UMD as well as the nearby government laboratories. We envision maintaining the size of this program while shortening the time to degree and raising the expectations for research.

Undergraduate Begun in 2012 and now containing 50+ majors, the AOSC major has an emphasis on exposing students to independent research. Our goals include expanding the appeal of this major by developing a joint BS/MS degree program, and a new initiative in computational science applied to environmental problems. Potentially we expect these to double the number of students enrolled in the AOSC undergraduate program. Critical needs for both the graduate and undergraduate majors as well as our Marquee courses include funding a set of teaching assistantships (we have a single 1/2TA).

3) Partnerships and Societal Engagement
The Department’s research and educational activities are important vehicles for partnering within the university and with several sectors outside of academia. For instance, our research products are of interest to institutions in the private sector, non-profits and international organizations. In addition to this, our students are in high demand for employment and intern opportunities in such institutions. In this strategic plan, we will emphasize involvement in these engagement actions towards enhancing the relevance and impact of our work on societal issues of climate and environmental security.