



UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

Office of System Architecture and Advanced Planning

SSMC1, Fifth Floor, Silver Spring, MD 20901

12 June 2023

MEMORANDUM FOR: Ed Grigsby, NESDIS/OSAAP
Pam Sullivan, NESDIS/GEO
Tim Walsh, NESDIS/LEO
Elsayed Talaat, NESDIS/SWO
Greg Marlow, NESDIS/OSPO
David Spencer, NESDIS/OSAAP

FROM: Mike Bonadonna, SAT Chair, NESDIS/OSAAP
Frank W. Gallagher, III, Sat Co-Chair, NESDIS/OSAAP

SUBJECT: The Arctic Observing Mission – Highly Elliptical Orbit Observations

1. Scope:

This memo provides background and recommendations on the need (or not) for NOAA to continue to participate in the Canadian Arctic Observing Mission (AOM) formulation and to provide as much assistance to the Canadians as possible.

2. Background:

The Arctic Observing Mission (AOM) is a variation of the previous AIM-North mission concept with an expanded scope that is under consideration by the Government of Canada for implementation with international partners. In addition to the greenhouse gas and air quality instruments, AOM would include a meteorological imager along with a space weather instrument suite.

NOAA's current meteorological imager in the Geostationary Operational Environmental Satellite (GOES) R series is the Advanced Baseline Imager (ABI). Discussions have begun about potential partnership between Canada, NOAA, and other organizations to include such an instrument on AOM. Coordinated studies will be required over the next few years to better establish contributions, roles, responsibilities, and position of the potential partners prior to a formal commitment to such an arrangement.

This international, Canadian-led, mission would deliver the greatest benefits for applications spanning northern weather forecasting, climate and greenhouse gas emission monitoring, air quality forecasting, pollutant emission monitoring and space weather science and operational activities.

3. Facts and Findings:

- a. Arctic temperatures have increased three to four times the global average, and this trend is expected to continue
- b. Temperature changes are linked to other changes in the Arctic system (e.g., ice, stratospheric ozone, permafrost, etc.) and more severe change is expected in the future
- c. Anthropogenic activity in the North is increasing (e.g., resource extraction)
- d. Permafrost holds approximately 1600 PgC (almost twice atmospheric mass) and estimates suggest release of approximately 5-15% of additional CO₂ or CH₄ by 2100
- e. The Arctic and northern latitudes are a region of the Earth that is undergoing rapid change and satellite Earth observations are a priority for Canada and for the Alaska regions of the United States
- f. AOM is an innovative Highly Elliptical Orbit mission concept for meteorology, Greenhouse Gasses, air quality, and space weather (including particle measurements and auroral imaging) with a strong focus on the northern latitudes (e.g., >45°N)
- g. AOM is envisioned as a Canadian-led international mission in which partnership contributions are essential to its success
- h. Recent progress on clarifying and solidifying intended NOAA and NASA contributions is a positive step forward, while Canada welcomes further involvement from international partners on other components of AOM

4. Recommendation:

Based on the facts highlighted above and the core-SAT discussions, the SAT recommends the following:

- Recommendation #1: NOAA should continue to participate in the formulation of AOM with the Canadians in order to monitor progress, provide technical assistance as appropriate and necessary, and influence the data collected by the future mission.
- Recommendation #2: NOAA needs to improve its satellite measurements over Alaska and surrounding US waters and territories.
- Recommendation #3: NOAA needs to improve its capability to measure the Earth's aurora.
- Recommendation #4: NOAA needs to make a timely and final decision on future participation in AOM as early as possible.

Important note: This memo was developed based on the deliberations and discussions among the core-SAT, which consist of federal employees only. These recommendations were made following extensive scientific fact-finding, review of the scientific literature, and SAT discussions with scientific experts and other knowledgeable in the field.