Understanding a Changing West Antarctic Peninsula

The 1st Workshop of the SOOS WAP Working Group; Cambridge, United Kingdom, 15–16 May 2017
In Icy Waters: The Future of Marine Biogeochemical Research off the West Antarctic Peninsula; Chicheley, United Kingdom, 17–18 May 2017

The R/V *Laurence M. Gould* casts its shadow on an iceberg along the West Antarctic Peninsula. This research vessel is deployed every January as part of the Palmer Long Term Ecological Research project to collect data and samples for a wide range of oceanographic studies. Two related meetings earlier this year assembled researchers from a large number of national programs to work toward an integrated approach to understanding climate-related changes in this region. Credit: Grace Saba

By Kate Hendry, Sian Henley, and Oscar Schofield 1 hour ago

The West Antarctic Peninsula (WAP) has experienced some of Earth's most rapid winter warming in recent decades. This warming has been associated with significant declines in sea ice, changes in upper ocean physics, and altered food webs and biogeochemical cycles.

Two jointly coordinated meetings earlier this year, involving more than 80 participants from 13 countries, addressed issues affecting this region. The Southern Ocean Observing System West Antarctic Peninsula (SOOS WAP (https://www.bas.ac.uk/event/west-antarctic-peninsula-working-group-workshop/)) Working Group meeting, held at the British Antarctic Survey headquarters, and the Royal Society (http://www.rug.nl/research/portal/activities/royal-society-international-meeting--west-antarctic-peninsula(4fa0311f-5b14-4df4-aaaa-5b498b7916c8).html) meeting at the Kavli Royal Society International Centre brought together this large international community to examine the pronounced climatic changes—along with their biological and biogeochemical consequences—in this region. Within the context of

rapid winter warming, the meetings also focused on defining the requirements for a WAP international ocean observing system to fill our knowledge gaps and address our future research priorities.

Participants defined a need to clearly define long-term WAP climate variability, along with associated ocean and atmosphere responses.
During the meetings, participants defined the overarching science drivers: the need to clearly define long-term WAP climate variability (https://eos.org/editors-vox/the-uncertain-future-of-the-west-antarctic-ice-sheet), along with associated ocean and atmosphere responses. Better understanding of key processes and interactions is important to determining to what degree climate variability and associated responses influence the significant ecosystem and ocean chemistry changes observed in this region.

Understanding connectivity among different components of the system is vital to understanding interactions between the atmosphere, ocean, and sea ice, as well as between organisms that live on the seafloor and those that live farther up in the water column. The participants agreed that the main barrier to this understanding was the lack of records spanning a sufficiently long term to detect decadal variability.

Participants also discussed the effects of significant gaps in high-resolution spatial and temporal data. Filling these gaps could resolve the feedbacks between the ocean, atmosphere, ice, and land that drive the dynamics of this polar system, they noted. The lack of data was especially large for the winter and early spring, before many of the national programs begin their sampling. Attendees agreed that the lack of data during this time of year is a particular challenge because new findings strongly suggest that these seasons are critical for physical changes in sea ice (https://eos.org/features/on-the-rocks-the-challenges-of-predicting-sea-level-rise) and ocean stratification and for the supply of nutrients. Both factors set strong controls on overall ecosystem productivity in the summer and associated biogeochemical cycling (https://eos.org/research-spotlights/antarctic-microbes-shape-nutrient-content-of-snowmelt).

The harsh conditions during winter necessitate the integration of autonomous technologies capable of sustained operation on, in, and under the sea ice.
From discussions emerged a possible path forward: The harsh conditions during winter necessitate the integration of autonomous technologies capable of sustained operation on, in, and under the sea ice. Because the WAP data are highly patchy over a range of spatial scales, attendees agreed that such that an integrated observing system would require improved regional ocean-atmosphere-ice models overlaid on a realistic bottom topography.

Another key finding that emerged during the meetings was that despite the presence of more than 30 international research stations (permanent or summer only) along the WAP, there are limited coordination and little standardization of scientific approaches among the national programs. Across the board, participants agreed that augmenting international collaboration, standardizing techniques, and opening up all data sources would be tremendous opportunities for science.

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