



ANTARCTIC CLIMATE
& ECOSYSTEMS CRC

Antarctic Climate & Ecosystems Cooperative Research Centre

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To: CNRS Charge de Recherche Selection Committee
From: Dr. Tom Trull, Professor of Marine Biogeochemistry
Regarding: Support letter for Dr. Melanie Grenier
Date: 7 January 2021

I have known Melanie Grenier since September 2012 when we met at a workshop to examine the sources of iron to the high biomass waters that form downstream from the Kerguelen islands in the Southern Ocean. I was impressed by her PhD thesis work which combined Lagrangian perspectives on water mass trajectories with rare earth element tracer measurements. This is a rare combination, as both techniques are at the cutting edge of marine science. I invited Melanie to come to Hobart as a postdoctoral fellow in the ACE CRC to explore further application of these methods, and to extend them to the interpretation of biogeochemical and bio-optical sensor measurements obtained using new generation robotic devices which drift freely in the ocean, rising and falling through the top kilometre and transmitting data via satellite (known as BGC-Argo profiling floats).

We were only able to offer 8 months of support, yet Melanie engaged wholeheartedly and did an admirable job of advancing interpretation of the rare earth element data and bringing new approaches to the evaluation of the Biogeochemical Argo profiling float results. In particular she established the ability to distinguish different REE sources using novel combinations of REE element ratios, and she developed a collaboration with colleagues in Grenoble to provide oceanic general circulation model results to allow comparison of 'numerical BGC-Argo' trajectories with the field results. The paper she published on the BGC-Argo float observations and their implications for carbon cycling was field leading at the time, and continues to be cited as an example of the value of the developing BGC-Argo global array.

Melanie's Charge de Recherche Project Proposal continues these themes, and addresses an extremely important component of global climate and biogeochemical cycles – the rapidly evolving Arctic Ocean. In particular, it will apply novel isotopic techniques to assess changing inputs from the surrounding coasts and atmosphere, and these tracers can also be used to assess sea-ice transport and mass balances. Sea-ice remains one of the least understood aspects of the global climate system, known to have strong influences on the planetary albedo, ocean circulation, and the carbon cycle via both air-sea gas exchange and ocean productivity. It's a timely, important, and powerful project deserving of support.

Melanie Grenier is a talented, insightful, and productive scientist. I endorse her application without reservation.

Sincerely,

Thomas W Trull
CSIRO Senior Principle Research Scientist
UTAS Professor of Marine Biogeochemistry
OceanSITES co-chair
Biogeochemical Argo steering committee member