

**CAN A FAST REPETITION-RATE FLUOROMETRY ESTIMATE PRIMARY PRODUCTION IN THE SOUTHERN OCEAN?**Y. Bryant<sup>1</sup>, F. B. Griffiths<sup>2</sup>, S. Wright<sup>3</sup>, B. Tilbrook<sup>2</sup>, A. McMinn<sup>1</sup>

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Frontal regions are reported to be regions of chlorophyll *a* biomass and increased productivity. Investigation of the characteristics of the Southern Ocean fronts and water masses was undertaken on two transects between Tasmania (44 °S) and the French Antarctic Base Dumont d'Urville (66 °S) from February 18, 2004 and March 4, 2004. The position of fronts and water masses was determined from the surface expression of temperature and salinity as well as from expendable bathythermograph probes. Productivity in the different fronts and water masses was examined using photosynthetic parameters from with a Fast Repetition Rate Fluorometer operated in continuous sampling mode and surface chlorophyll derived from measurements of underway fluorescence made with a conventional fluorometer calibrated with hplc chlorophyll-*a*. A relationship between fluorescence parameters and irradiance was found and was incorporated in the production calculations in the data. The maximum quantum yield of fluorescence ( $F_v/F_m$ ) for the entire cruise ranged from 0.02 to 0.48, well below the maximum value of 0.65. This was most likely due to a combination of iron and silicate limitation north of 60 °S and possible iron limitation south of 60 °S. There was no evidence of increased chlorophyll *a* biomass and productivity in frontal regions along the southbound and northbound cruise legs. The Polar Frontal zone had lower rates of productivity than any other front or water mass. Primary production comparisons were made between FRRF-derived hourly carbon fixation rates and radiocarbon-derived hourly carbon fixation rates from historical data sets because no radiocarbon measurements were made during this voyage. These parameters did not correlate well but t-tests comparing the two methods found, that the results of the different productivity comparisons within individual water masses were not significantly different. This highlights the possibility of using the FRRF for routine estimation of primary production from ships of opportunity in the Southern Ocean.