

2. Description of Project (Attach additional pages as necessary)

Excerpts from Clearance document
<p>This project is focused on studies of the effects of iron and light co-limitation on phytoplankton communities in the deep chlorophyll maximum of stratified oceanic regions. Currently, thanks to a large number of field studies about iron limitation, it is possible to approximately describe horizontal variability in waters in the world's oceans like in waters of Antarctica, the equatorial Pacific and the Arctic sub-region of the Pacific. These regions are characterized at present with high concentrations of nutrients and low chlorophyll concentrations (HNLC) due to the limitation by iron. Nevertheless, many questions exist related to the vertical variation in iron and its relation to biological communities. This appears mainly in regions where there is stratification outside the HNLC zone and where there is a strong influence due to light gradients, temperature and nutrients. These oligotrophic conditions promote nutrient recycling and deep chlorophyll maxima (DCM) located at the nutricline. The DCM is considered the main source of new production in oligotrophic regions of the oceans and it has been hypothesized that DCM communities are limited simultaneously by both light and iron. In this investigation, we are testing the hypothesis of the light-iron co-limitation in oxygen minimum zones where communities of <i>Prochlorococcus</i> are dominant in the DCM. Significantly for our proposed study area, the tropical region along the North Pacific coast of Mexico is well recognized for its subsurface suboxic waters. Main objectives include chemical and biological characterization of the upper water column, and conducting incubation experiments on board ship with DCM communities.</p>

3.3 Particulars of methods and scientific instruments

Types of samples and data	Methods to be used	Instruments to be used
<p>Samples: whole and filtered seawater Data: chemical composition of seawater, composition and photosynthetic physiology of in situ and incubated phytoplankton communities</p>	<p>Characterization of the water column: Measurements of temperature, light attenuation, chlorophyll fluorescence, salinity, and dissolved oxygen will be made using a profiler. In addition, seawater samples will be collected to determine nutrients, dissolved inorganic carbon, total alkalinity, and pH. This information will be important for determining the position of the DCM in the water column. Iron analysis: Ultraclean techniques for iron analysis will be used. Special Teflon bottles will be used to avoid</p>	<p>Sampling: CTD rosette and GO Flo bottles for profiling water column Analysis at sea: Fluorometer for chlorophyll, FIRE for active fluorescence measurements, ¹⁴C incubations on ship for primary productivity, voltammetric and flow-through injection analysis for iron chemistry. Additional biological and chemical samples will be preserved for analysis on shore by a variety of methods.</p>

	contamination of samples collected in the DCM. There will be detailed iron determinations in the DCM region of the water column.	