



**University
of Victoria**

Graduate Studies

**Notice of the Final Oral Examination
for the Degree of Master of Science**

of

JIN-SI R.J. OVER

BSc Hons (University of North Carolina and Wilmington, 2016)

**“Last Interglacial (MIS 5e) Sea Surface Hydrographic Conditions in
Coastal Southern California Based on Dinoflagellate Cysts”**

School of Earth and Ocean Sciences

Thursday, April 18, 2019

8:30 A.M.

Bob Wright Centre

A319

Supervisory Committee:

Dr. Vera Pospelova, School of Earth and Ocean Sciences, University of Victoria (Supervisor)

Dr. Jon Husson, School of Earth and Ocean Sciences, UVic (Member)

Dr. Richard Hebda, School of Earth and Ocean Sciences, UVic (Member)

External Examiner:

Dr. Elisabeth Levac, Department of Environment and Geography, Bishop's University

Chair of Oral Examination:

Dr. Dan Smith, Department of Geography, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The first high resolution record of dinoflagellate cysts ~110-155 kyr over Termination II and the last interglacial in the Santa Barbara Basin, California from ODP Hole 893A details a complex paleoceanographic history. Changes in cyst abundances, concentrations, diversity, and assemblages reflect climatic and ocean circulation changes, and are successfully used to make quantitative reconstructions of past sea surface temperatures and annual primary productivity with the modern analogue technique based on a dinoflagellate cyst database from the northeast Pacific. The dominance of heterotrophic dinoflagellate cyst taxa *Brigantedinium* spp. throughout most of the section indicates coastal upwelling is an important influence on the basin. Based on the dinoflagellate cyst assemblages, five cyst zones are identified and approximately correspond to the marine isotope stage boundaries and their associated changes in sea surface temperatures and sea level. Cooler intervals, MIS 6 and MIS 5d, are characterized by cold-water indicator species *Selenopemphix undulata* whereas thermophilic taxon *Spiniferites mirabilis* characterizes MIS 5e. In contrast to other studies in the Pacific, the data shows a one to two thousand year cooling event similar to the Younger Dryas and is consistent with the Termination II sea level reversal ~129 kyr of the two-step deglaciation. A significant increase in cyst concentrations of heterotrophic and autotrophic taxa in the latest MIS 5e implies enhanced primary productivity as a result of increased seasonal upwelling and the warm, nutrient rich waters entering the basin after sea level stabilizes near modern levels. The hydrological evolution of the last interglacial is similar to that of the Holocene in the Santa Barbara Basin, but the sustained presence of *Spiniferites mirabilis* across MIS 5e indicates sea surface temperatures were noticeably higher than present conditions. The quantitative reconstruction supports dynamic sea surface temperature changes across the studied interval (~6.2-10.7°C in February; ~12.6-20.3°C in August) that are similar to modern ranges, while annual primary productivity was confined to a higher narrower range (~456-586 g C m⁻² yr⁻¹).