

Summary Report
LTOR Cross-Site CCE, MCR and SBC Synthesis Workshop
Working Group for Comparative Regional Ocean Modeling
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Goals: Instigate cross-site collaboration involving ocean modeling topics;
Develop outlines for proposals for leveraged support.

Key topics: Based on the presentations and discussion at the workshop, five main topics arose, with a large number of overlapping issues. This summary is meant to serve as a reminder of the key points, connections among sites, and possible collaborators.

1) Regional-scale ocean circulation around Moorea

Focus: Regional scale interaction between broad-scale currents, local atmospheric forcing, and mesoscale eddies around the Tahiti-Moorea islands.
Modeling resolution to roughly 1km over 1000km-scale region.

Science Topics: Distribution of observed AVISO eddies due to instabilities and island wake forcing.

Interactions of eddies and mean flows with trapped circulation and upwelling patterns around the islands.

Why is there a CCW mean flow year-round Moorea?

Effect of buoyancy inputs, locally and large-scale.

Island steepness is difficult to deal with in models.

Extensions: Future coupling with local circulation model (2) over the reef, future connectivity studies with Lagrangian particles, future NPZ model to address relative importance of land ecosystem runoff vs open ocean ecosystem production,

Possible collaboration/proposal participants: Miller, Franck, Leichter, Washburn

2) Local circulation over the Moorea Reef

Focus: Surface wave, internal wave, local wind, local runoff, and regional current forcing of flows over the detailed reef structure and topography.

High-resolution (30m) Primitive Equation modeling.

Science Topics: Effects of coral reef roughness on flows.

Wave influences on coral morphology.

What controls trapped waves around Moorea?

Internal wave cold surges: GM spectrum as null hypothesis for predicting how often cold surges occur.

M2 amphidromic point near MCR: What drives the local internal waves observed there?

Radiated internal waves and interaction with South Equatorial Current.
Bathymetry uncertainties a major issue (French may have sidescan dataset).

Possible collaboration/proposal participants: Lynch, Leichter, McWilliams

3) Connectivity pathways in MCR, SBC and CCE

Focus: Larval transport timescales among Moorea, Tahiti and Archipelago of Tuamotus.
Directly apply to MCR the procedures developed for connectivity matrices in SBC.

Science Topics: Short larval lifespans suggest local retention.
Effects of vertical migration and swimming on larval transport?
Lunar cycles?
Shelf-slope topography in SBC generates local circulation that can trap particles and flows.

Extensions: Connectivity among all the islands in the South Pacific – 10km resolution modeling: Curchitser and Kleypas

Possible collaboration/proposal participants: Siegel, Edwards, McWilliams, Curchitser

4) Temporal and Spatial Scales of Phyto and Zooplankton around MCR and in adjacent open ocean

Focus: Origin of subsurface chl maximum near island (1.5 vs. 0.3 offshore @80-100m).

Science Topics: Pelagic-coastal interaction and nutrient transport.
Degree influence of lateral vs. horizontal transport in establishing communities.
Internal wave fluxes of nutrients: Seasonal internal wave forcing?
Chl max may be due to photoacclimation of cells, not associated with particle maximum and not a production maximum; requires a nitrogen or carbon budget to sort it out.
Has Chl max enhancement been observed elsewhere, e.g., Hawaii?

Possible collaboration/proposal participants: Broad interest in this topic

5) Reef ecosystem sustenance

Focus: Interplay of all the effects considered above.
Disturbances due to storms – forest fire analogy – recovery, resilience, succession.

Science Topics: Coral biome/land-flux interaction: nutrients and sedimentation.
Carbon-nitrogen budgets; land vs. oceanic support, chl-max influence on corals.
Consideration of fish and starfish.

Possible collaboration/proposal participants: Broad interest in this topic
This seems to be one of the central issues of the MCR LTER.