IMOS Integrated Marine Observing System

Australian Coastal and Oceans Modelling and Observations (ACOMO) Workshop

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The models

• Use of models and observations to understand dynamics of major currents around Australia, their transport and effect on biological communities (e.g. heat transport, reef fish distribution)

• Sea ice modelling well coordinated modelling effort through consortiums

• Un-structure model grids are better for coast with superior resolution but slower to run. Some have compared well with observations (i.e. Storm Bay)

• Several examples of use of models/obs to inform management: hypoxia in estuaries, POMS, current strength prediction for lobster pots, environmental intervention for coral bleaching.
The models

• National modelling system: a database with one access point to all models (including operational). Building blocks are there with MarVL and DeVL.

• Sub-mesoscale, a new frontier for data assimilation, but need to be careful (SLA)

• Use of machine learning for species distribution models to predict change.
The models

• Use of Bayesian models as an alternative to numerical models, simpler and can use low and high value data (coral bleaching prediction)
• 3 models 2-way coupled possible due to computational advances, good for predicting extremes (cyclones)
• Microbes should be key component of models (ecosystem, BGC)
• Using hind-cast and relationship with variables, reconstruct the biogeography of microbes in the past
The observations

• Changes of biogeography in space and time to ID indicator species for ecosystem change (microbes to fish)

• Difference in sampling techniques an issue for use in models (IMPORTANCE FOR CONSISTENT OBSERVATIONS). There are alternatives, model data statistically to bring data sets together and better integrate with models

• Issue with sea-ice observational community with lack of coordination, seeking insights on how to address this from IMOS
The observations

• Better integration across trophic levels will be good to have

• **Use of Artificial Intelligence to fill observational gaps**

• Satellite wind speed needs a stability correction for long term trends due to issues on how altimeters and radiometers

• Dataset on waves from satellites ready to go from 1985 to now. Calibrated and validated. Issue with coast, some work (re-track wave forms to 10 km).
The observations

• Molecular technology has advanced very fast and good coordination in marine microbial community made standardise collection possible for a baseline of marine microbes around Australian oceans

• Use of acoustics could be use in model assessment/assimilation.
The integration

• For assimilation, calibration or validation both models and observations together useful to describe major current features

• Across scales there is use of unstructured models as well as structure models with high resolution models (closer to coast) nested in lower resolution offshore models

• Obs and models used as management tools for fisheries and environmental intervention (oxygenation, cooling, shading)
The integration

• Our Tasman Front world crumbled!
Eddie field not front, need to use the right terminology
Eddies go west but also go east ?!

• Fronts, a question of spatial and temporal scales? biology vs physics. Biology can act and respond at different spatial and temporal scales to physics
The integration

- Statistical model of observations useful to assemble disparate datasets and integrate into models
- Integration across scales from microbial DNA to bioregions.
- Great integration examples in the Gulf of Mexico, from physics to biology (connectivity), across scales and for operational application (oil spill).
- Integration of physics to low trophic levels
- Use of physics to help explain some biological patterns (e.g. reef fish distribution)
Actions/recommendations

Artificial Intelligence

• Use AI to fill gaps in IMOS timeseries. Perhaps through current work of mooring network?
• Use it to find relationships (normally multivariate) in biology to see which are the variables that are important
• Experts in that field needed, a working group that can scope an activity in this space?
Actions/recommendations

National Modelling System of systems

- Access to model data and models from different communities in central location (database of models?)
- AODN/IMOS to be part of this.
- Building blocks are there with MarVL

CARS (CSIRO ATLAS OF REGIONAL SEAS)
Is it time to update?
Other trends with time
Some ideas to increase diversity

• Increase student participation and early career scientist
• Don’t do the workshop during school holidays (AMSA?)
• Invite only an issue
• Travel support or student prizes
What next?

• ACOMO 2020?
• Align with AMSA/AMOS
• Off years have session AMSA/AMOS
• Working groups or TT?
• What about the open ocean modellers/estuaries?
THANK YOU!!!