Superparamerization in Ocean Modeling : A deep convection example

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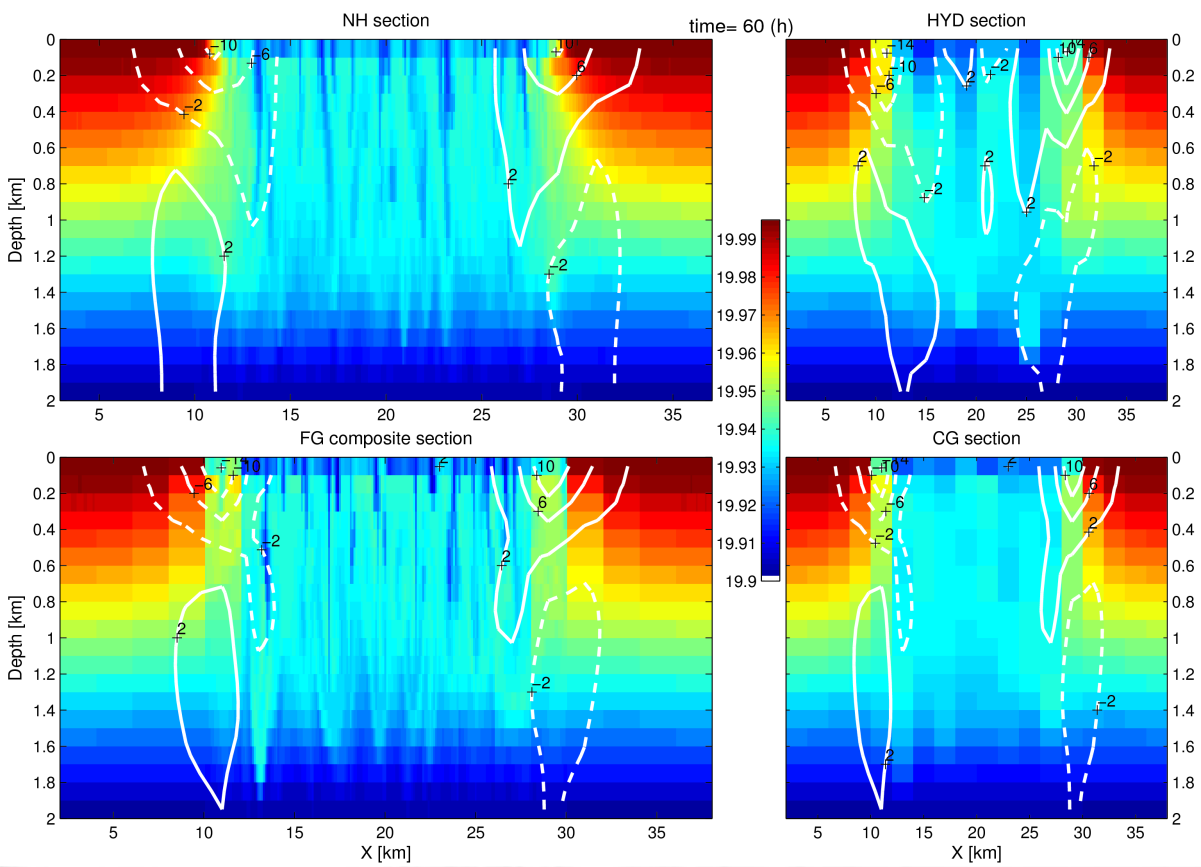
Concept :

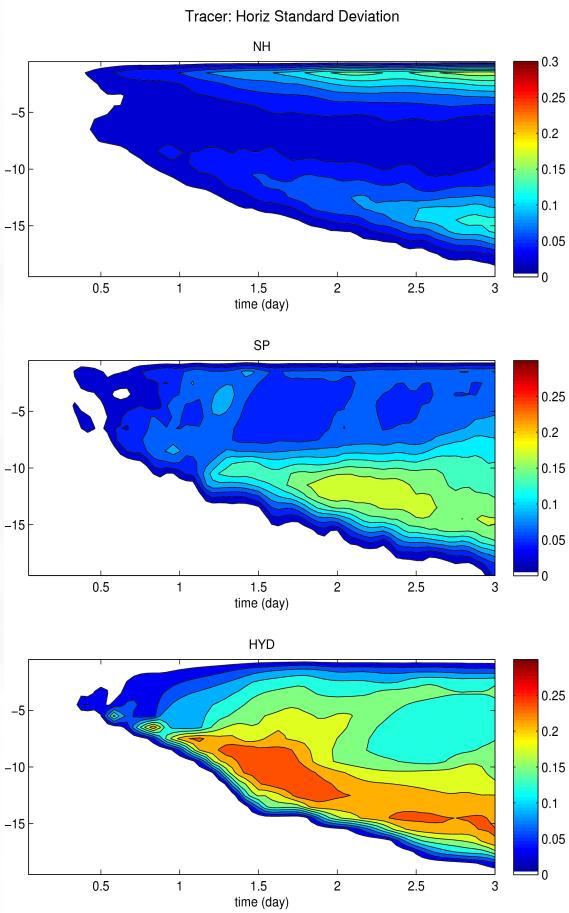
Explicitly resolve sub-grid scale processes in each column of a large-scale, coarse resolution model

- Needs scale separation
- No need for parameterization: small scale processes are explicitly simulated
- Cost: much cheaper than fine scale resolving model over the full 3-D domain

Deep Convection test case: compare 3 set-up

1) 3-D High resolution non-hydrostatic model
2) 2-D non-hydrostatic plume model embeded in each column of a coarse hydrostatic model
3) Coarse hydrostatic model with convective adjustment



Temperature in one vertical radial section after 60h, for the 3 cases:
Top left: Fine 3-D non-hydrostatic; Top right: Coarse hydrostatic;
Bottom left: composite of all 2-D plume models along this section ;
Bottom right: same but averaged on the coarse grid.

Evolution of tracer horizontal standard deviation inside the convective region:
Top: Fine 3-D non-hydrostatic
Middle: Coarse + 2-D plumes
Bottom: Coarse hydrostatic