

SPMODEL: A Series of Hierarchical Spectral Models for Geophysical Fluid Dynamics

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with
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SPMODEL project, dcmmodel project, Davis project

<http://www.gfd-dennou.org/library/spmodel/>
<http://www.nagare.or.jp/mm/2006/spmodel/index.htm>

What is "SPMODEL"?

- A series of spectral models which enable easy execution of standard numerical experiments in earth and planetary fluid dynamics problems
 - allow anyone to read, use, and modify the source codes,
 - readability and understandability of the source codes to permit easy re-building and/or modification
 - ease in visualization and post-processing of output data
- Source codes can now be written with a form which is easily deduced from the mathematical expressions of the governing equations
 - systematic function naming rules
 - use of array-handling features enhanced by Fortran90

SPMODEL programming style

- Naming style of variables
 - Grid data : starting with 'g_'
 - Spectral data : starting with 'e_'
- Naming style of functions in 'spml'
(output data space identifier)_(action)_(input data space identifier)
- Example :
$$g_Data2 = g_e(e_Dx_e(e_g(g_Data1)))$$

similar to the contraction convention of the tensor calculus

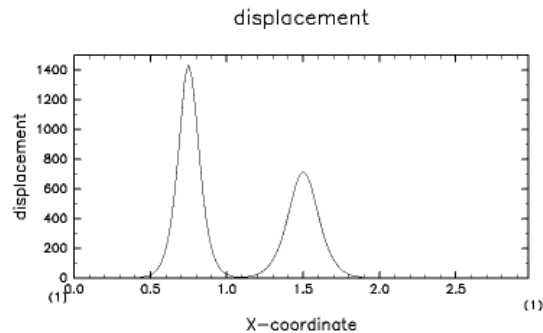
Exapmle of SPMODEL Programing

- KdV equation: $\frac{\partial \zeta}{\partial t} = -\zeta \frac{\partial \zeta}{\partial x} - \frac{\partial^3 \zeta}{\partial x^3}$

```
do it=1,nt  
  e_Zeta = e_Zeta + dt * &  
    (-e_g(g_e(e_Zeta)*g_e(e_Dx_e(e_zeta))) &  
      -e_Dx_e(e_Dx_e(e_Dx_e(e_zeta))) )  
enddo
```

SPMODEL Gallery

- KdV equation

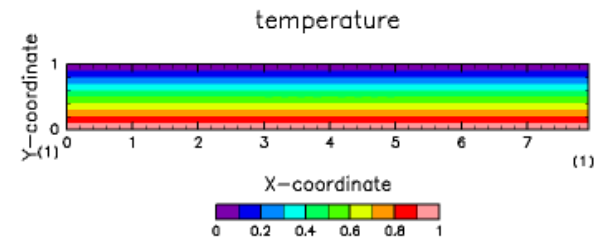


t=0.1

/usr/X11R6/bin/2005-10-06

kdv.cdf

- Fixed heat flux convection

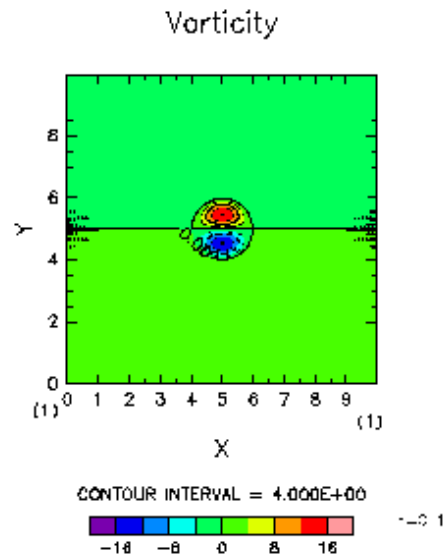


t=0.1

/usr/X11R6/bin/2005-10-06

bcnrm-01-1.cdf

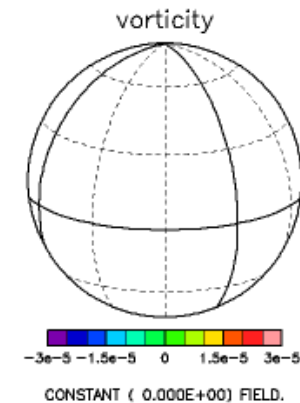
- Modon



/usr/X11R6/bin/2005-10-06

modon-01-1.cdf

- Shallow water model on a rotating sphere



/usr/X11R6/bin/2005-10-06

shallow-01-1.cdf