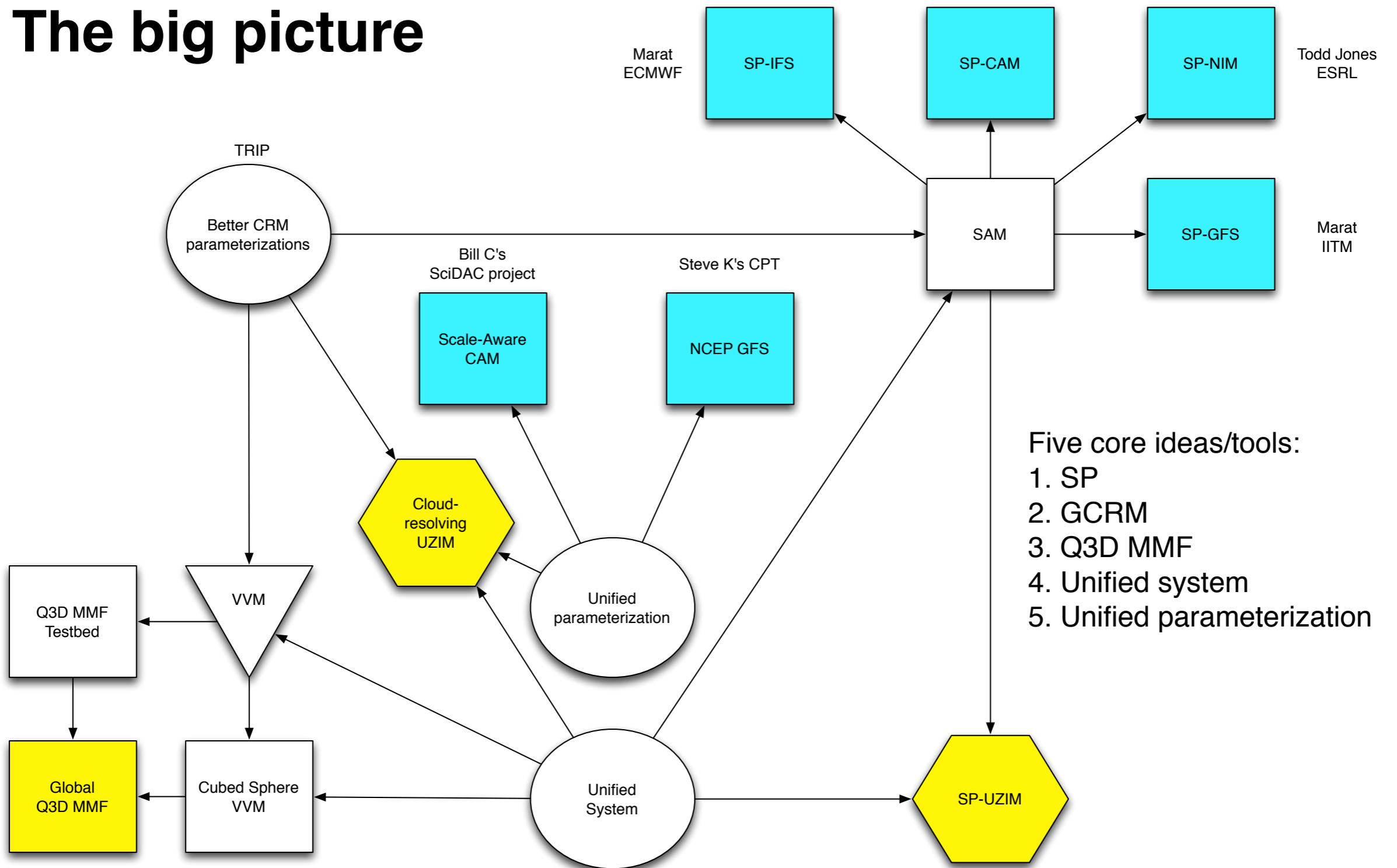
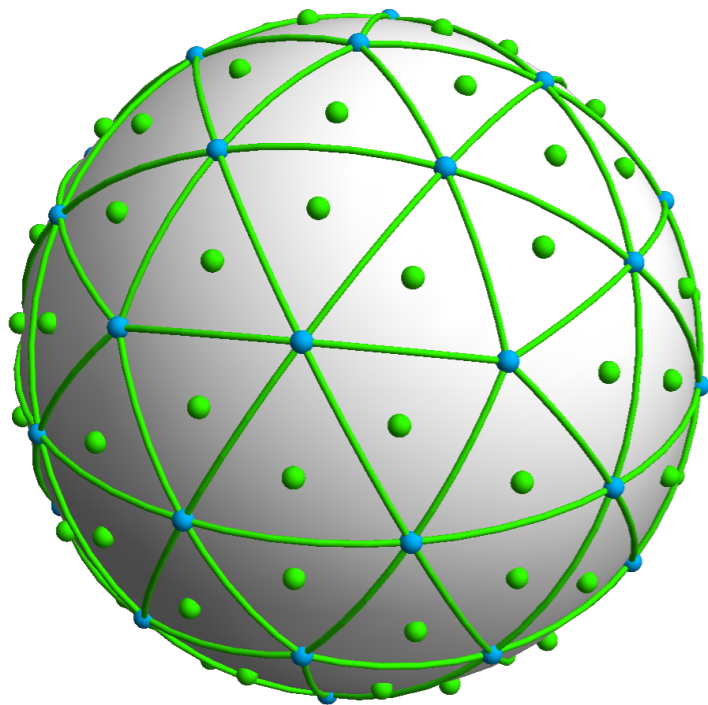


# The big picture

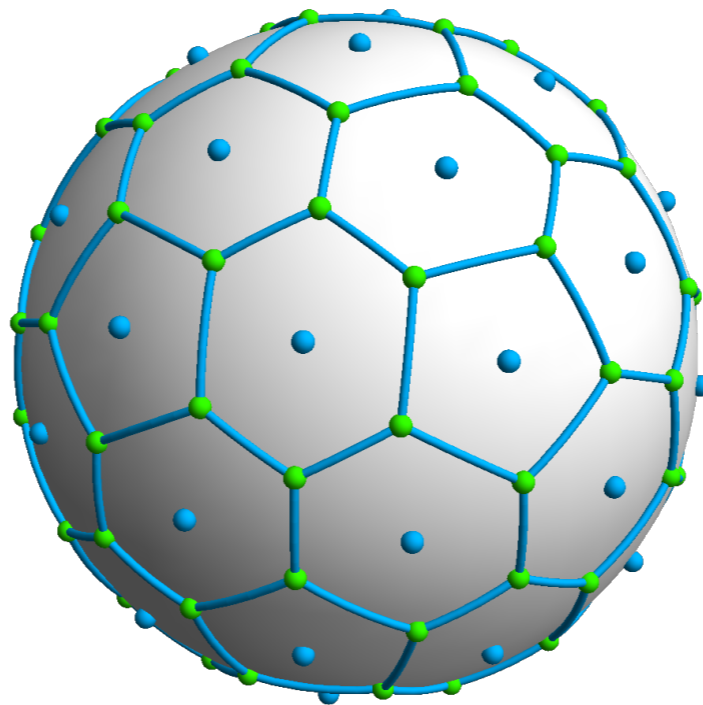


# Unified Z-Grid Icosahedral Model (UZIM)

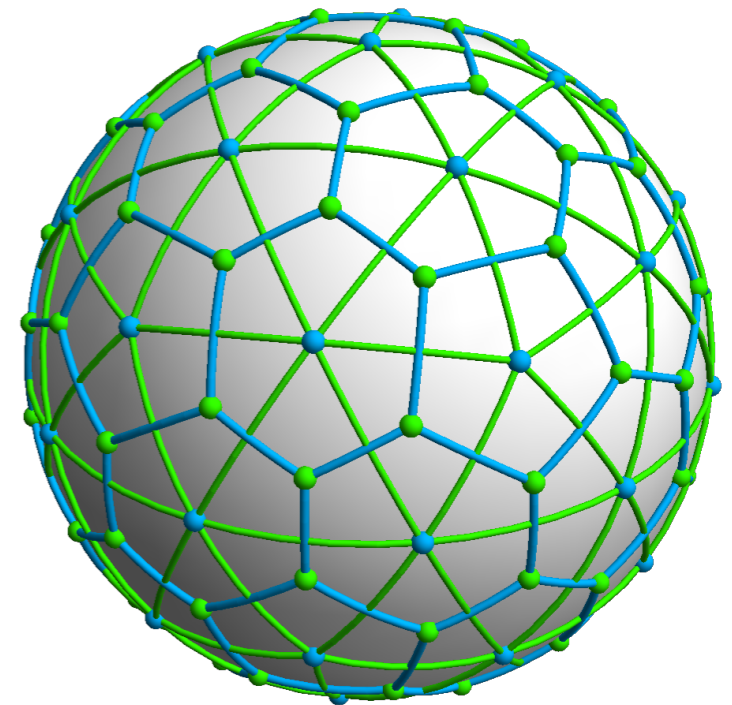
a)



b)



c)



Unified System  
Vorticity and divergence equations  
Geodesic grid

# UZIM ongoing work I

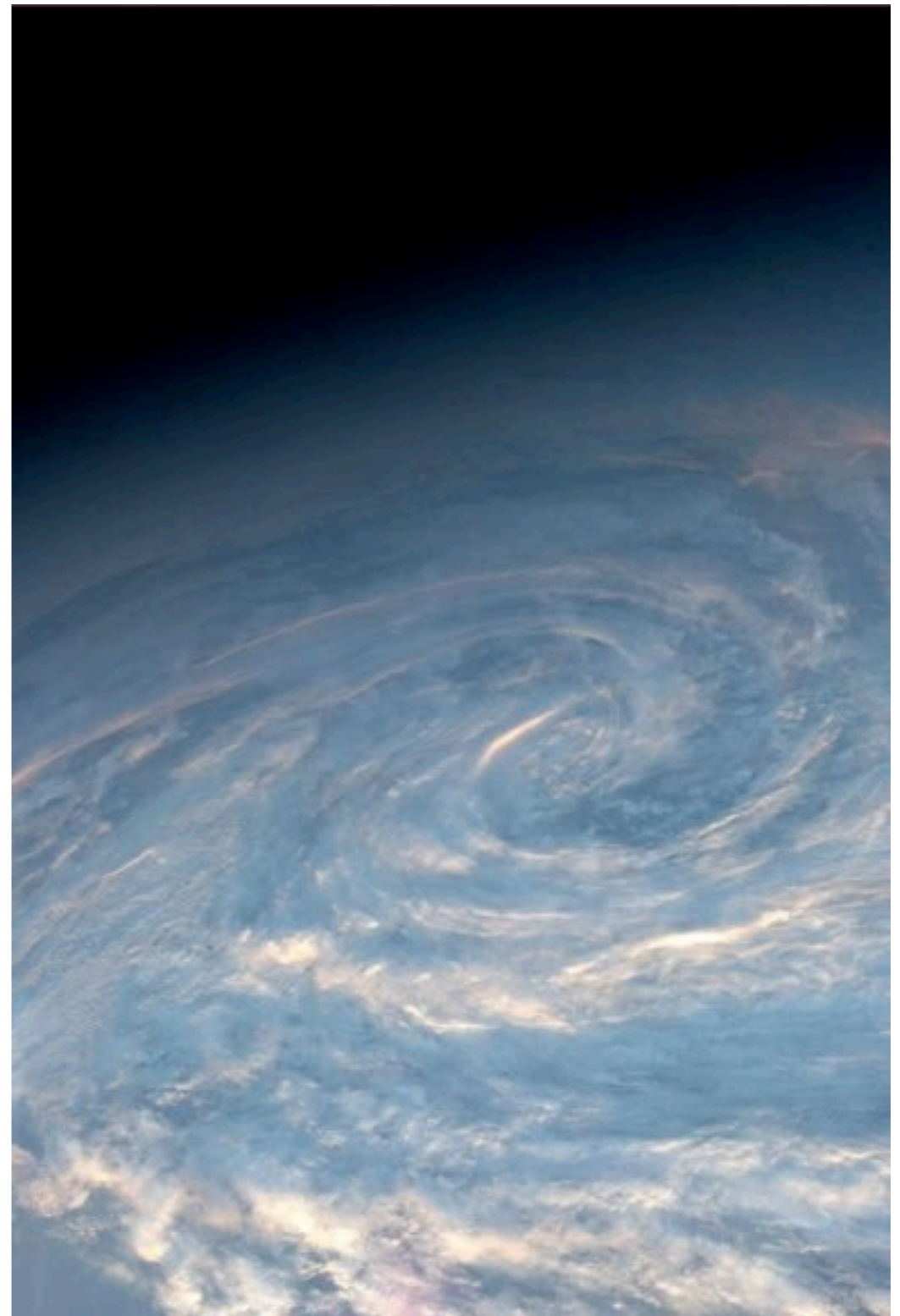
## ◆ Solvers

### ▲ Multigrid

- Works well in 2D
- Does not converge well in 3D

### ▲ Conjugate-gradient method

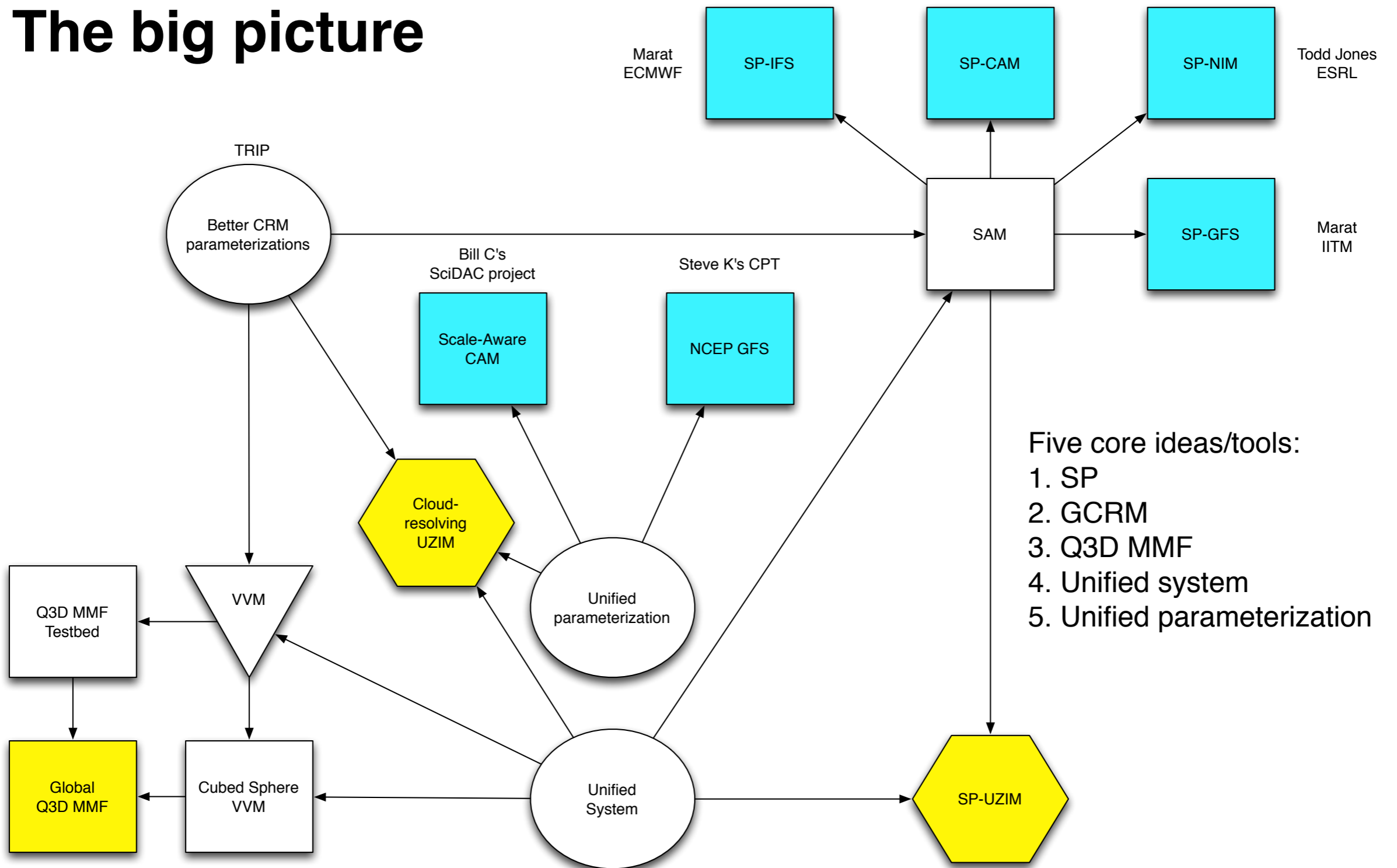
- Ocean modelers use this
- Works well in 3D
- May be good for blocked mountains
- Scaling not tested yet
- Combine with multigrid?

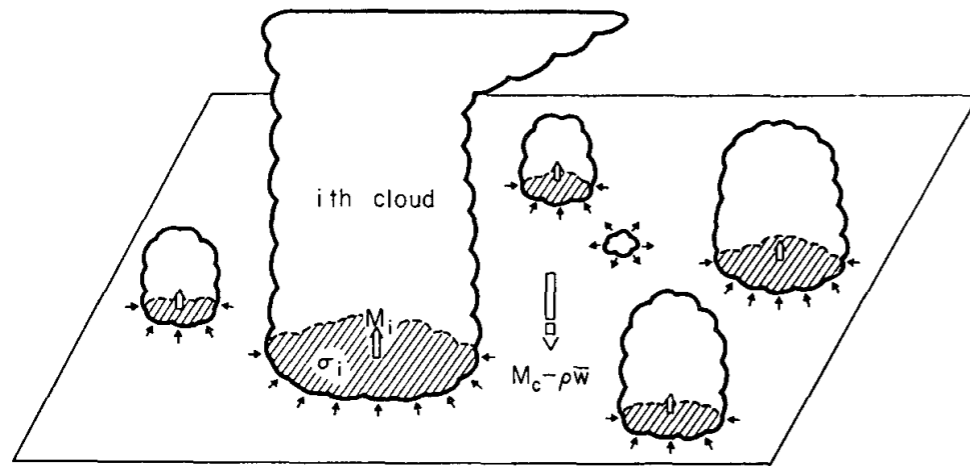


# UZIM ongoing work 2

- Height coordinate version works well
  - ▲ Topography is not included.
  - ▲ Aquaplanet applications are planned.
- Sigma coordinate version exists and is being debugged. It is stable and solutions are smooth but there is something wrong.
- SP version is being debugged. It will be used in the coarse-grid, hydrostatic regime.
- Plan to implement SAM physics for use in at high-resolution.
- Plan to implement Unified Parameterization for use with variable resolution.

# The big picture

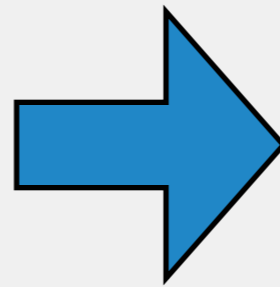




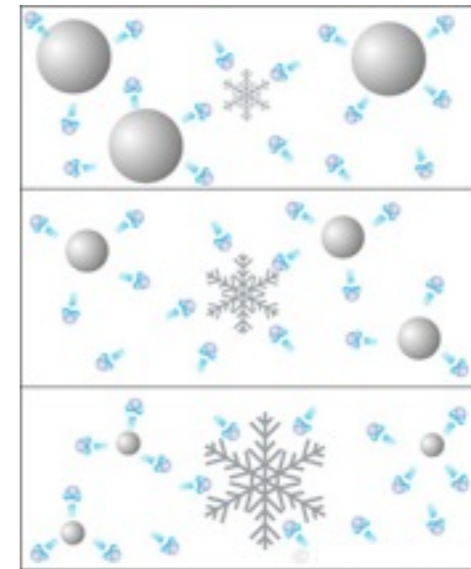
## GCM

Parameterizations for low-resolution models are designed to describe the collective effects of ensembles of clouds.

Grey  
Zone



Increasing  
resolution



## CRM

Parameterizations for high-resolution models are designed to describe what happens inside individual clouds.

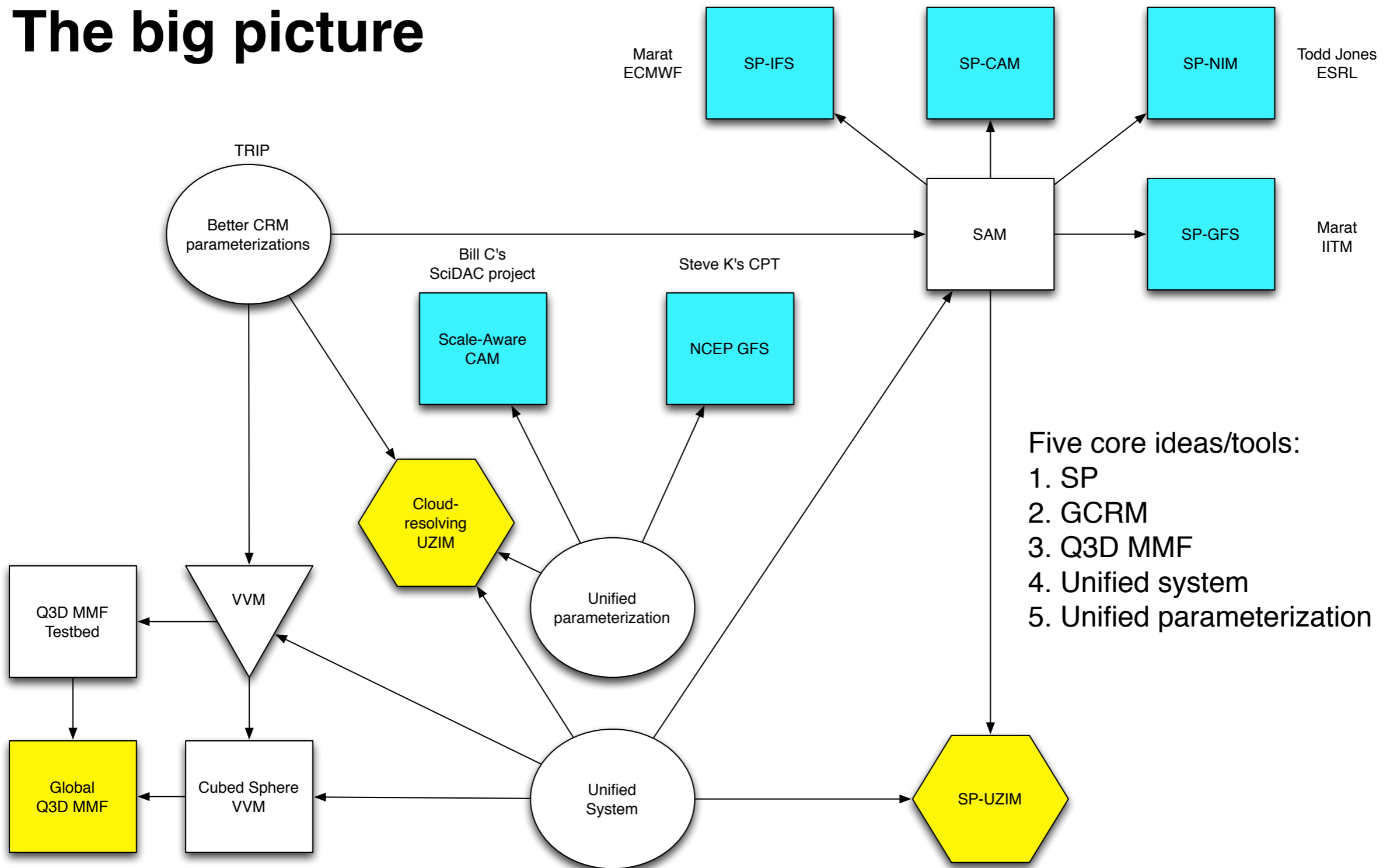
# Unified Parameterization

Akio Arakawa et al.

- ◆ Grow individual clouds when/where the resolution is high.
- ◆ Parameterize convection when/where resolution is low.
- ◆ Continuous scaling.
- ◆ One set of equations, one code.
- ◆ Physically based.



# The big picture





# Unified Parameterization

- Plan to modify Chikira-Sugiyama parameterization to work as Unified Parameterization.
- First target model is CAM5.
  - ▲ Funded by Collins SciDAC project.
  - ▲ Mick is installing SG parameterization in CAM5 now.
  - ▲ Mick will modify to create Unified Parameterization.
- Second target model is NCEP GFS.
  - ▲ Funded by Krueger CPT.
  - ▲ Wait for success with CAM5?
- Plan to implement Unified Parameterization for use with widely variable resolution.

# Q3D MMF

- Joon-Hee will report progress with the testbed in her plenary talk.
- Celal will discuss global implementation on a cubed sphere.



# Miscellaneous



- Cubed sphere momentum and VVM and Z-grid
- Voronoi cubed sphere
- Unified system in the VVM
- Unified system in SAM
- OpenMP
- GPUs

# The big picture

