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# New Results on FVM

**QuESpace Science Club**

**26.2.2010**

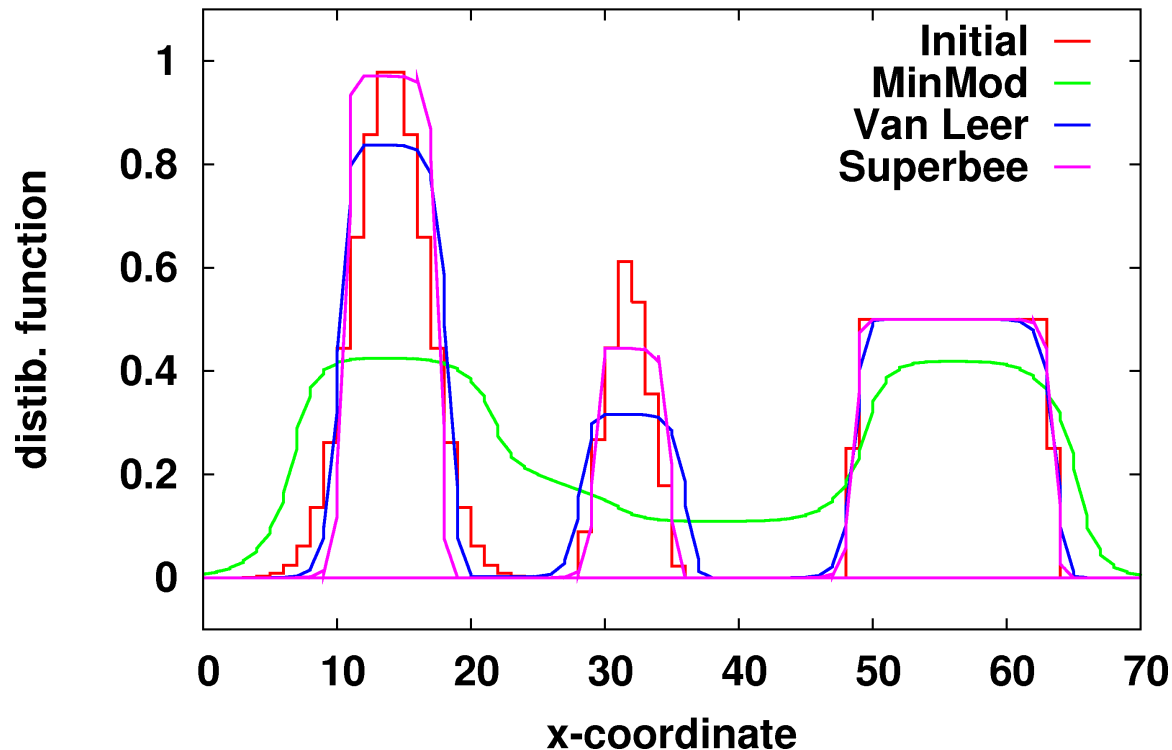
**A. Sandroos**



# Linear advection tests (1d):

2<sup>nd</sup> order solver (piecewise linear rec. + RK2).

2000 time steps

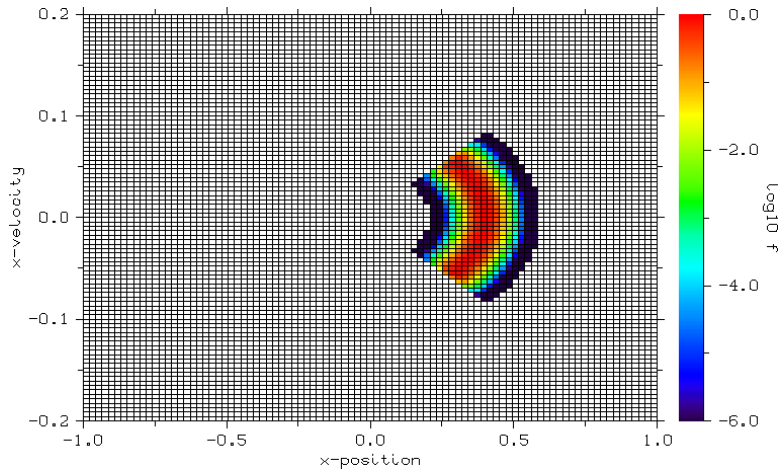




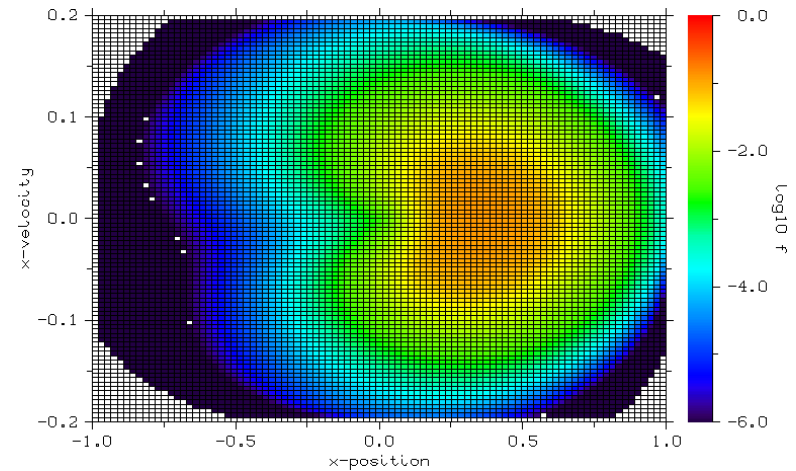
5000 time steps

# Harmonic oscillator tests (1d1v): 10 periods

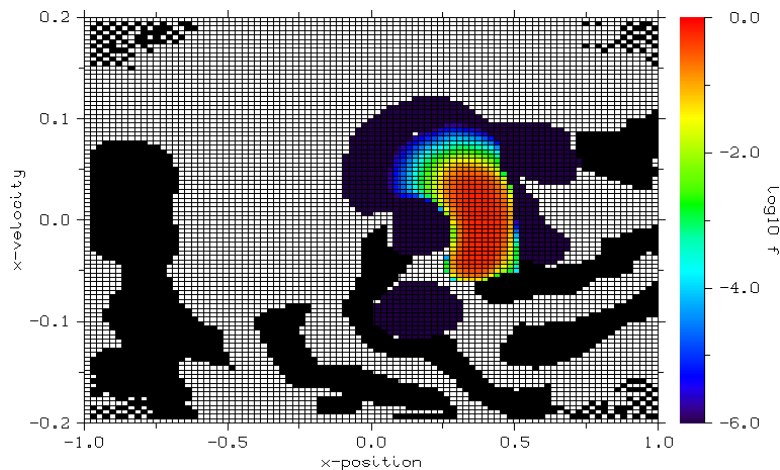
Initial state



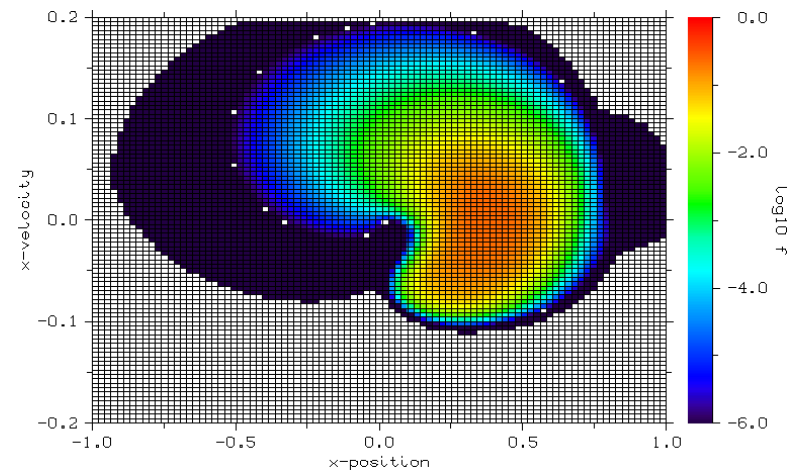
MinMod



Superbee



Van Leer





# Limiter does matter!

- Currently only using PLM reconstruction.
- Results have improved a lot.
- Relatively simple to use & efficient (narrow stencil).
- However, in ideal MHD simulations Superbee limiter often(?) does not work.
- Next task is to couple 1D3V FVM Vlasov with a field solver and do more tests to see if diffusion is still tolerable.
- “Antidiffusion” of Superbee will somehow couple with diffusion of field solvers, results unknown at this point.



# Memory & Time requirements

## These are for a homogeneous grid

- 23x92x92x92 grid ( $x*vx*vy*vz$ ) ~18M cells
- 9 variables per cell (avg, derivs, fluxes)
- Each variable 4 bytes (floats)
- Need two grids (RK2)
- **Result:** 1.2 GB memory, ~10 secs per time step

However, it is not optimized to the teeth.