

Fixed step computational efficiency ( $kx = 1.0$ , grid = 128)

temporal relative error

 $10^1$   
 $10^0$   
 $10^{-1}$  $10^0$  $10^2$  $10^4$  $10^6$  $10^8$  $10^{10}$ 

runtime (sec)

- DIRK2 + Jacobi
- DIRK2 + hypre
- DIRK3 + Jacobi
- DIRK3 + hypre
- SSP-RK-2
- SSP-RK-3
- SSP-RK-4
- RKC-2
- RKL-2