

Dublin Summer School on Gravitational Waves

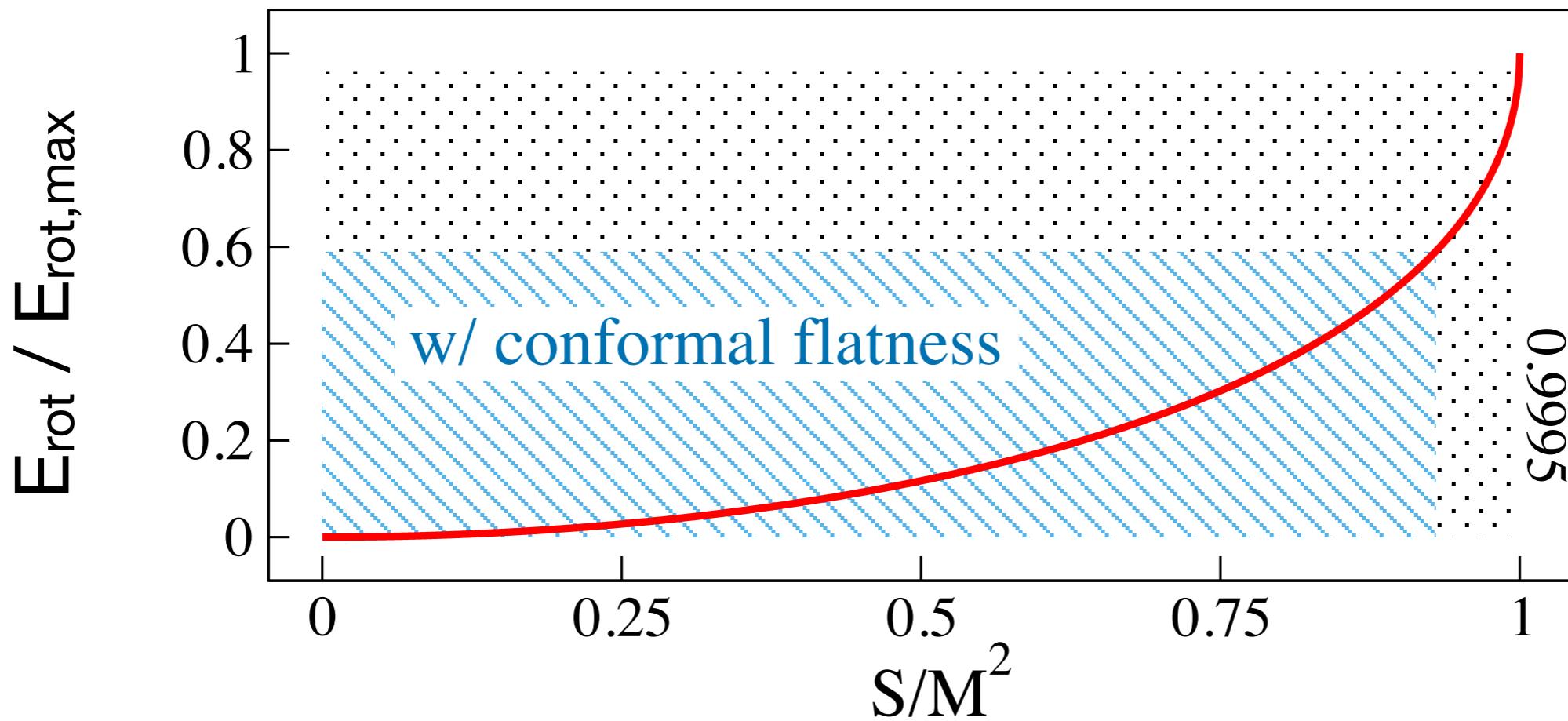
June 2018

Numerical Relativity Day 2

supplementary material

Harald Pfeiffer
AEI

How extreme is $S/M^2 \sim 0.93$?

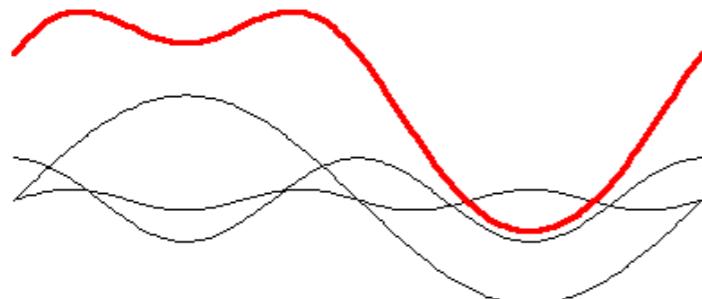


Spectral Einstein Code (SpEC)



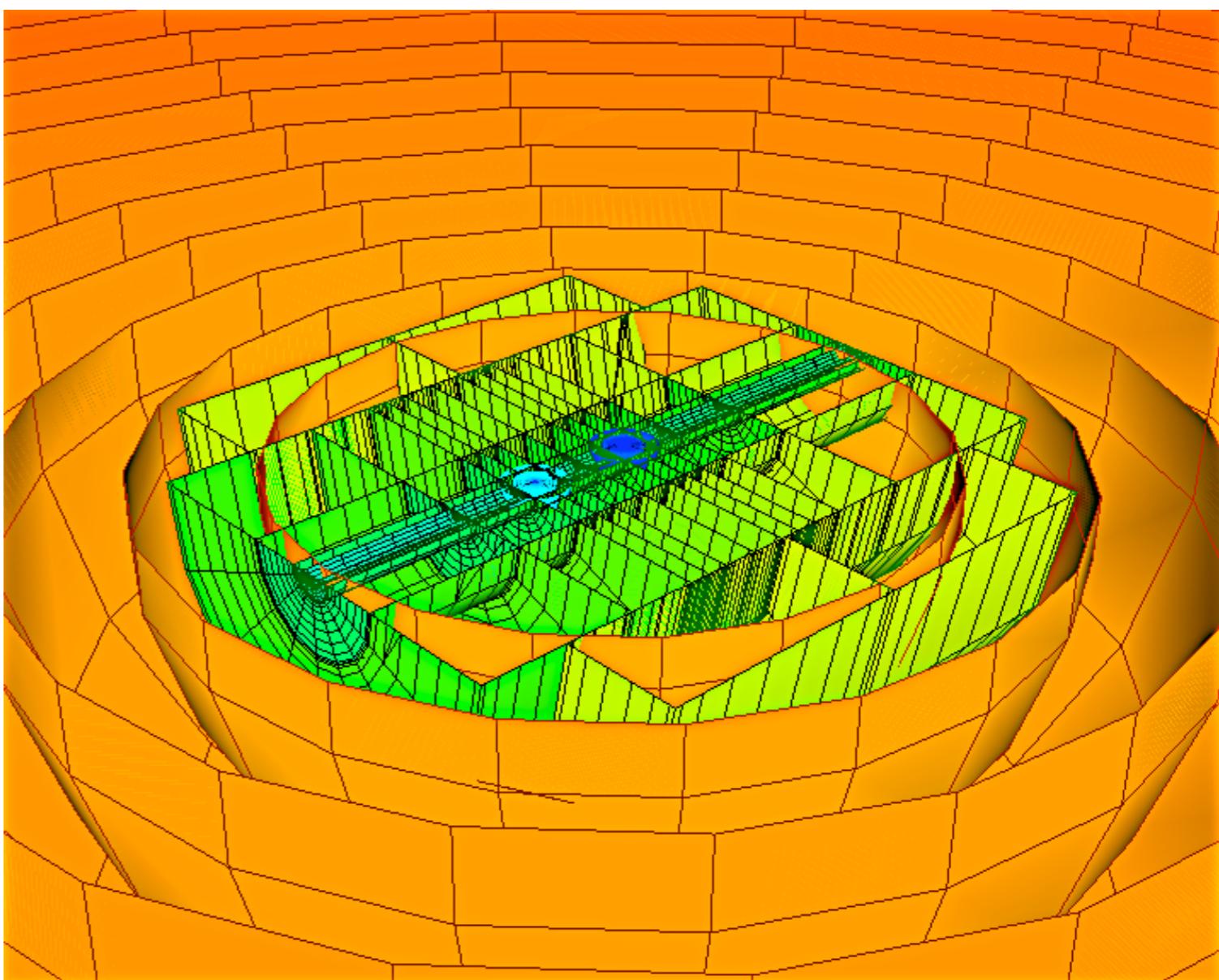
- Expand in **basis-functions**

$$u(x, t) = \sum_{k=1}^N \tilde{u}(t)_k \Phi_k(x)$$



- Compute derivatives **analytically**

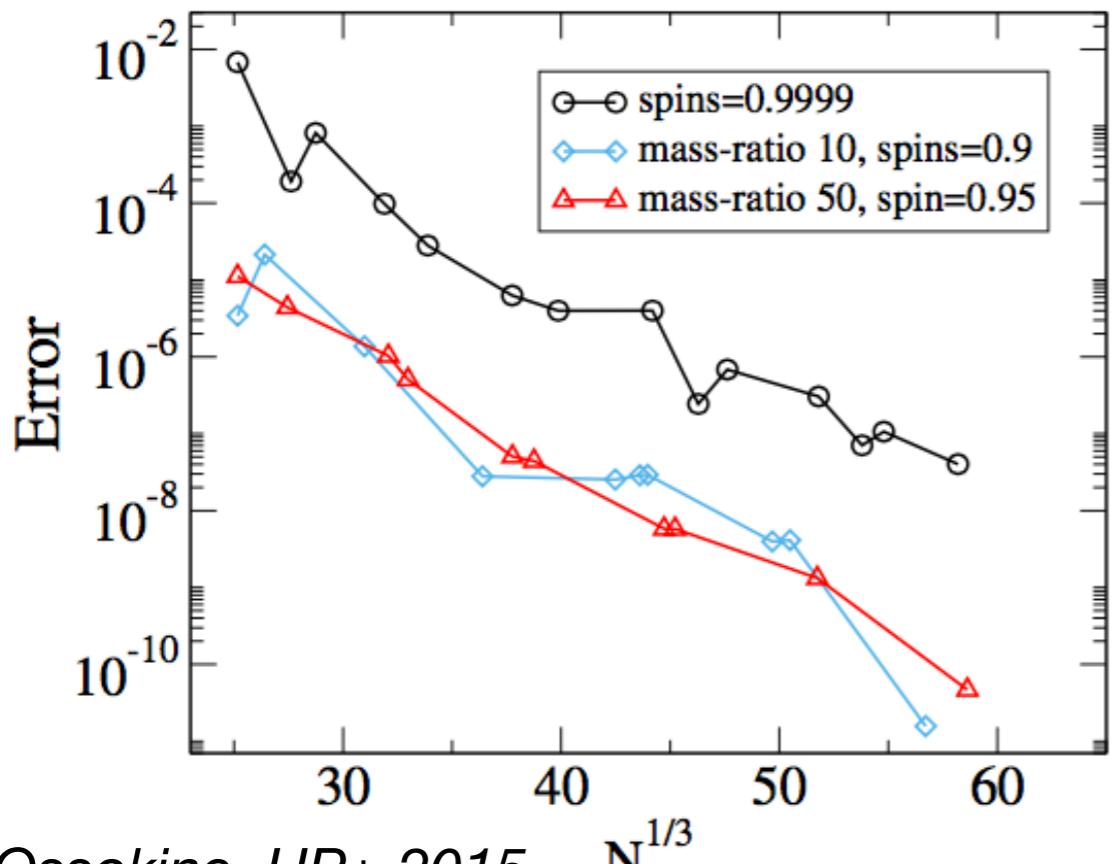
$$u'(x, t) = \sum_{k=1}^N \tilde{u}(t)_k \Phi'_k(x)$$



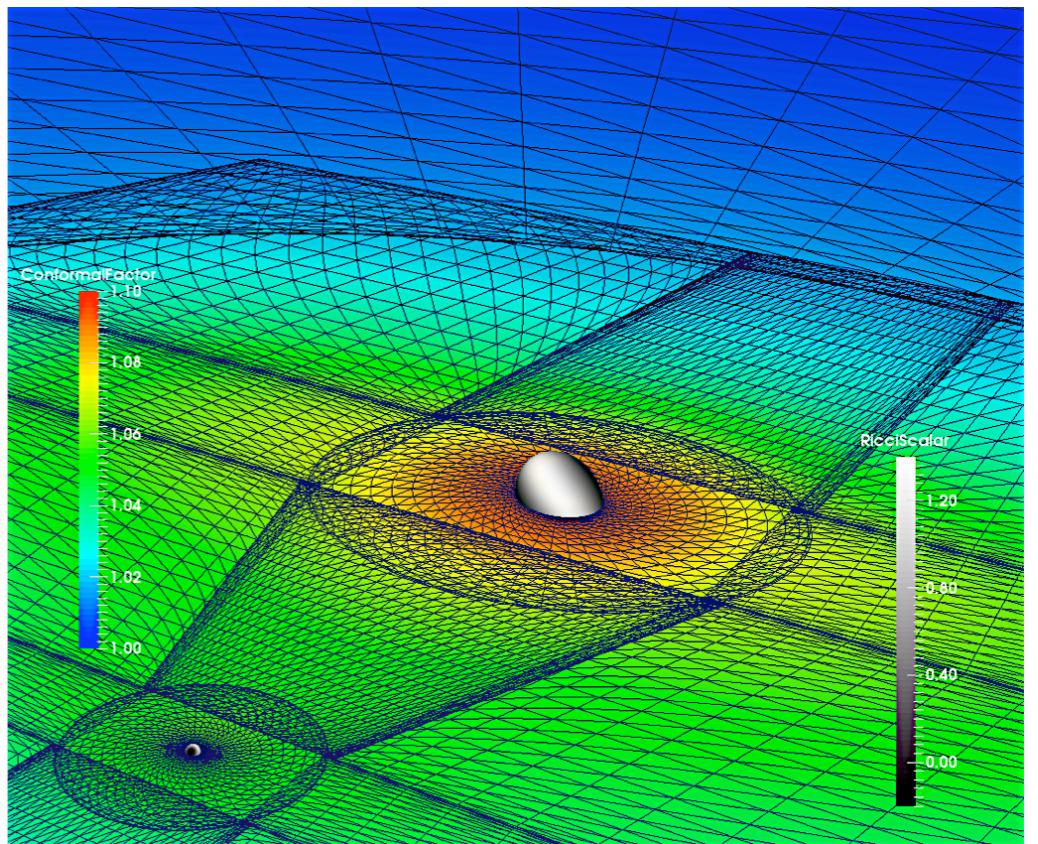
Simulations of Extreme Spacetimes (SXS) collaboration



SpEC's initial data solver



Ossokine, HP+ 2015
(improving on HP+ 2003)



- Solving elliptic equations
 - All DoF coupled, must solve large matrix equation:

$$\mathbf{A}\mathbf{u} = \mathbf{r}, \quad \mathbf{A} \in \mathbb{R}^{N_{\text{DoF}}, N_{\text{DoF}}}$$