# Some Notes on Discussions during the Söllerhaus Workshop 2019

## Günther Of

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Tasks:

- topic for master's thesis: preconditioning with bubble functions?

- Honza: prepare preconditioning like in paper with Stefan Dohr

- Raphael, Günther: check pFMM for hypersingular operator, in particular $\frac{\partial G_\alpha}{\partial \tau}$

- Raphael, Günther: provide operations in space for non-uniform time steps

- Raphael, Günther: compare approach for non-uniform time steps to Messner's and Tausch's compression in the temporal nearfield.

- Michael, Raphael: discuss interfaces in the code

- Michael, Raphael: basic pFMM implementation

- Günther, Raphael: test smoothing in time for the sphere (ideas from pdes on manifolds or 1D)

Some details on the interface (provided by Michal):

- create pFMM matrix taking care of multiplication:
  - holding temporal & spatial trees, nearfield matrices, orders of L. polynomials
  - calling computing of moments, tree traversal, etc.

- add matrix-matrix product to BLAS interface

- store Q2M clusterwise (or in a long global array?)

- create class for evaluation of Chebyshev, Lagrange polynomials

- how to store coefficients $\mu$?
  - They depend on both temporal and spatial cluster $\mu(I_k^\ell \times X_n^{\ell_x(\ell)})$.

- – will have to have a space-time clusters and tree . . .

- sources
  - – naturally sorted in time, need sorting in space?
  - – Start with the existing mapping from clusters to the global mesh, later on, sort the spatial mesh.

- Q2M store like 1D array time-slice wise

- M2M:
  - – parent calls operation? To avoid race conditions.
  - – 8 matrices per level, each cluster level has the same matrices
  - – store them separately somewhere

- maybe Q2M on the fly later on (for general meshes), e.g., student on GPU? Just a possibility for future.