Title: "N-site modeling of ice polycrystals using the Fast Fourier Transform; fluctuation of stress and strain rate fields" by Paul Duval, Ricardo Lebensohn, Maurine Montagnat and Sophie de La Chapelle, LGGE/CNRS, Grenoble, France and Los Alamos National Laboratory, USA

The plasticity of the ice crystal is governed by the motion of basal dislocations within the basal plane. Under the same prescribed shear stress, strain rate by basal slip is more than three orders of magnitude higher than that measured when the ice crystal is loaded along or perpendicular to the c-axis. In the polycrystal, the mismatch of slip at grain boundaries induces the development of a non-uniform internal stress field, which is associated with gradients of plastic strain and a relatively large density of geometrically necessary dislocations. Both compatibility and stress equilibrium across grain boundaries result in heterogeneous intragranular deformation patterns. A new N-sites model based on the use of the Fast Fourier Transform (FFT), introduced by Lebensohn (2001) for viscoplastic materials, has been applied to predict stress and strain rate fields in the ice polycrystal. This FFT approach is based on the solution of a unit-cell problem or Representative Volume Element (RVE) with periodic conditions. The RVE is discretized into a regular grid of Fourier points, corresponding to a given grain. Each grain is itself represented by a large number of Fourier points. The FFT solution gives values of the stress and the velocity gradients fields in each Fourier point. It therefore allows the computation of heterogeneous intracrystaline states in each grain.

The larger stress heterogeneities appear in "hard" grains near grain boundaries with a significant activity of non-basal slip. For a given grain orientation, a large dispersion of mechanical parameters is found, which is related to the influence of neighborhood of the considered grain. The interest to use such a N-site approach to simulate the deformation and texture development of ice is shown.

Lebensohn, R. (2001) A N-site modeling of a 3D viscoplastic polycrystal using Fast Fourier Transform, *Acta mater.*, 49, 2723-2737.