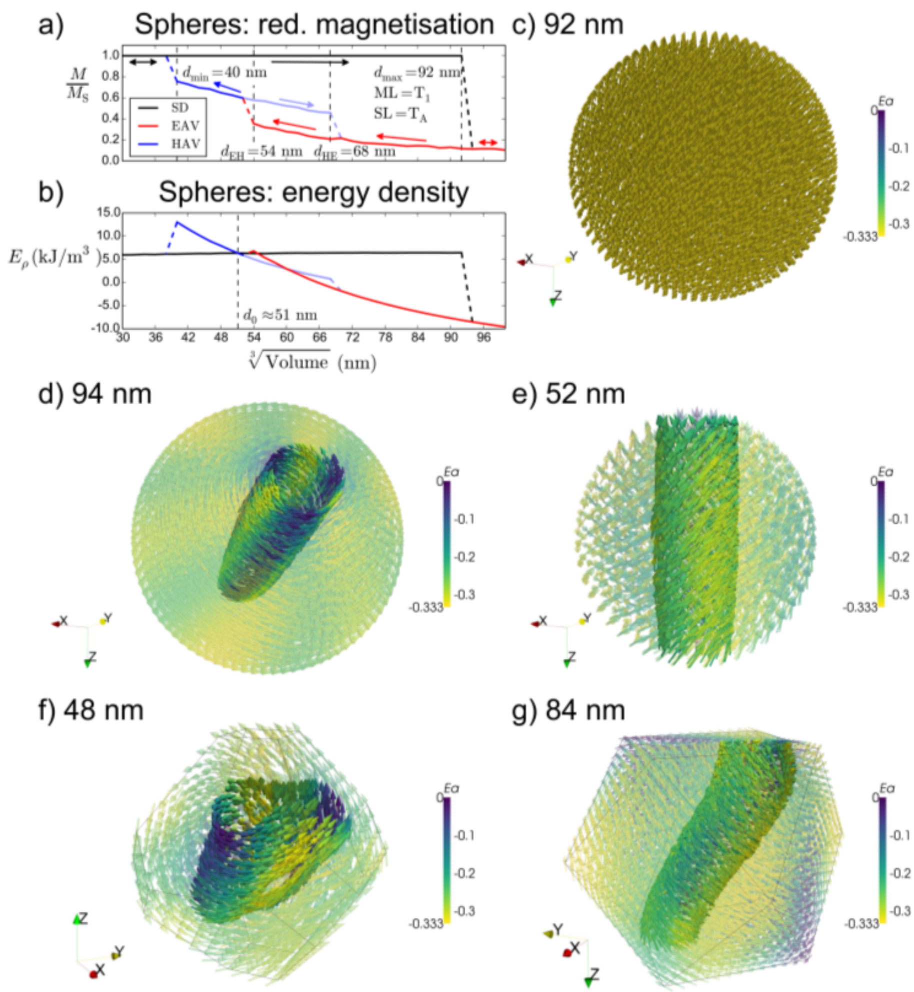

Figure 2: Micromagnetic structures of spheres and intermediate-aligned vortex states. Reduced magnetisation (a) and energy density (b) against size. The SD $[\bar{1}\bar{1}\bar{1}]$ state is numerically stable up to $d_{\text{max}} = 92$ nm (c). Growing this solution to a 94 nm grain it is found to relax to a $[\bar{1}\bar{1}\bar{1}]$ EAV (d), stable up to 120 nm. The EAV is then interpolated into smaller grains, stable down to $d_{\text{EH}} = 54$ nm (a). At 52 nm the EAV goes to a $[00\bar{1}]$ HAV (e), stable down to $d_{\text{min}} = 40$ nm. At 38 nm, the solution relaxes to the original SD state (a). This sequence is referred to as a Type 1 *main loop* (ML). Growth of the HAV from 52 nm forms the Type A *secondary loop* (SL): the HAV is found to be stable up to $d_{\text{HE}} = 68$ nm (a) and to realign with the easy direction at 70 nm. Vortex states can not only be easy or hard-aligned, but also <011> intermediate-aligned vortices (IAVs) (f) and distorted IAV configurations (dIAV) (g). MLs in which IAVs are found are referred to as Type 2. Colour represents the MCA energy normalised by $|K_1|$. The vortex cores are highlighted by obtaining a helicity ($K = \boldsymbol{m} \cdot \nabla \times \boldsymbol{m}$) isosurface and reducing the opacity of the rest of the arrows.