Sinking organic matter in the North Atlantic Ocean transfers 1-3 Gt carbon yr⁻¹ from the surface ocean to the interior. The majority of this exported material is thought to be in form of large, rapidly sinking particles that aggregate during or after the spring phytoplankton bloom. However, recent work has suggested that intermittent water column stratification resulting in the termination of deep convection can isolate phytoplankton from the euphotic zone, leading to export of small particles. We present depth profiles of large (>0.1 mm equivalent spherical diameter, ESD) and small (300 m depth, leading to deep mixing of particles as deep as 600 m. Subsequent restratification could trap these particles at depth and lead to high particle fluxes at depth without the need for aggregation ("mixed-layer pump"). Overall, we suggest that prebloom fluxes to the mesopelagic are significant, and the role of small sinking particles requires careful consideration.