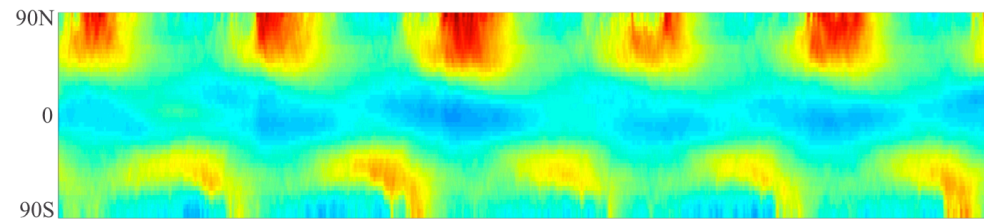
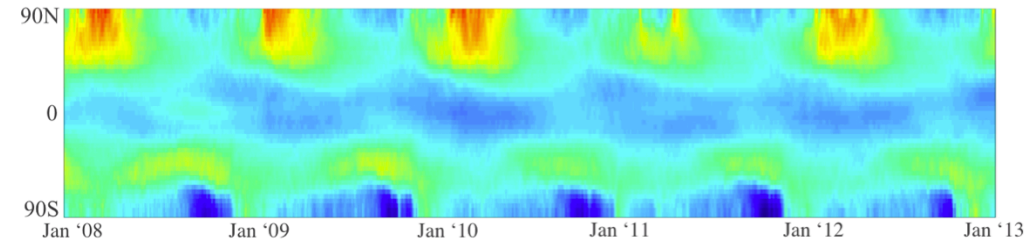


(a) standalone forward GEOS-Chem UCX model



(b) pre-UCX GEOS-Chem adjoint forward component



(c) GEOS-Chem UCX adjoint forward component

