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Climatological analysis of the life cycles of stratospheric intrusions

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Baroclinic waves undergo different life cycles depending on the ambient horizontal shear conditions (e.g. Thorncroft et al., 93). The waves of each life-cycle type, exhibit a characteristic deformation during their breaking stage, that is well visible in a potential vorticity - potential temperature framework. The change of the background flow due to large-scale modes can be expected to have an influence on the breaking of the baroclinic waves (e.g. Shapiro et al., 98). It is also proposed, that the breaking waves themselves have a significant influence on the large-scale modes. Benedict et al. (2004) have shown a strong interrelation between the NAO and breaking synoptic scale waves.

A 44-year climatology of breaking baroclinic waves in the tropopause region, compiled using a potential vorticity based identification routine, is used to determine the spatial distribution of two different life cycles. A cyclonic and an anticyclonic life cycle are separated in the climatology on the bases of the orientation of main axis of the baroclinic waves.

Climatological composites of each life cycle show a clear spatial separation of the main maxima of occurrence along the extra tropical tropopause. The cyclonic life cycle is prevalent in the main storm track areas in the Pacific and the Atlantic. In contrast the frequency maxima of the anticyclonic life cycle are found upstream of the two major storm tracks over the continental US and Eastern Europe.

A clear difference in the prevalence of the life cycles is found when comparing the subtropics and extra tropics, cyclonic life cycles are more frequent in the extra tropics whereas anticyclonic life cycles occur more often in the subtropics.

The possible linkage of breaking baroclinic waves and large-scale modes of the at-

mosphere is investigated. Statistical linkages between the occurrence of the two life cycles and the large-scale climate modes will be presented.