成層圏突然昇温回復時のシア不安定

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Shear Instability during the Recovery of Stratospheric Sudden Warmings

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This study examines why the persistence of easterly wind during major stratospheric sudden warmings (SSWs) varies from one SSW to another. From the 22 SSWs identified between 1979 and 2009, six long and six short SSWs, of easterly wind periods longer than 20 days and shorter than 10 days, respectively, are chosen and their composites are compared. While the polar-night jet is stronger than the climatological jet before long SSWs, the preconditioning of the polar-night jet tends to occur before short SSWs. After the occurrence of SSWs, the easterly wind of short SSWs quickly returns to the westerly wind due to large positive Eliassen-Palm (E-P) flux divergence in the winter polar stratosphere. The easterly wind of long SSWs lasts for 20-40 days because the E-P flux divergence is small even if it is either positive or negative. Such a difference of E-P flux divergence originates from the difference of upward E-P flux from the troposphere. On the other hand, the positive E-P flux divergence during short SSWs is not caused by the variation of upward E-P flux from the troposphere, but could be due to the shear instability caused by the overreflection of zonal wavenumber 1 planetary waves at the critical surface. The difference of persistence of easterly wind between long and short SSWs has a large impact also on the planetary wave activity in the winter stratosphere.