Kodera, K., N. Eguchi, R. Ueyama, B. M. Funatsu, M. Gaetani, and C. M. Taylor, 2021: The impact of tropical tropopause cooling on Sahelian extreme deep convection. *J. Meteor. Soc. Japan*, **99**, 1127-1139.
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Plain Language Summary: There has been a recent increase in heavy precipitation over Sahel in West Africa following decades of severe drought. This study shows that West Africa exhibited a cooling trend in the tropical lower stratosphere and tropopause layer since the 1980s, combined with a warming in the troposphere. These temperature changes destabilized the atmosphere and induced extreme deep convection over the Sahel where penetrating convection is frequent. In contrast, tropospheric warming suppressed the shallower convection over the neighboring Guinea Coast. This feature is similar to that which might result from increased greenhouse gas levels.

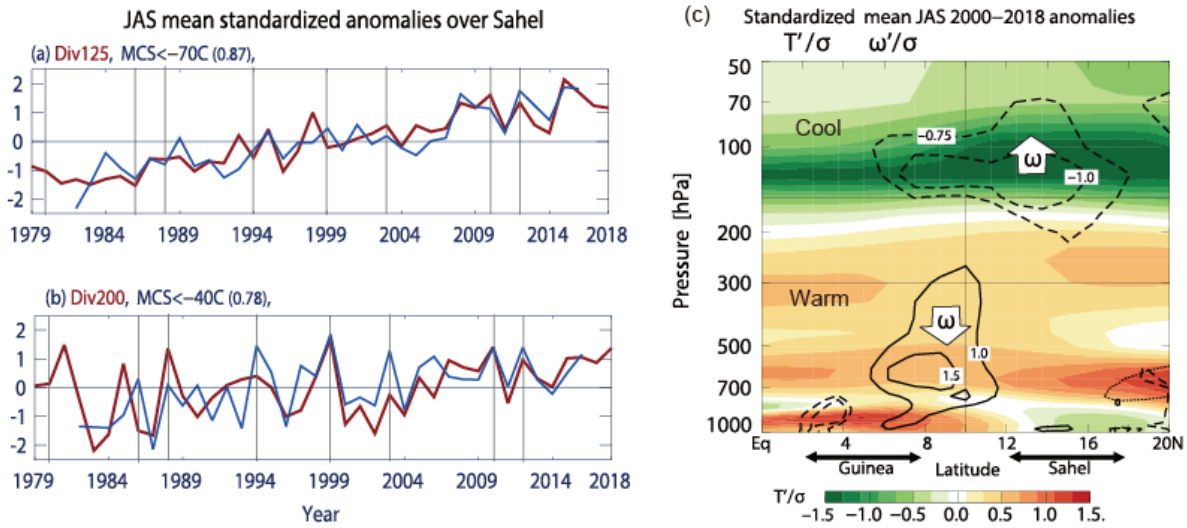

Figure 1. (a) Horizontal divergence (brown lines) in the tropical tropopause layer (TTL) at 125 hPa and occurrence frequency of MCSs with a cloud top temperature (CTT) (blue lines) below −70°C (extreme deep convection). (b) Divergence in the upper troposphere at 200 hPa and MCSs with a CTT below −40°C (usual deep convection). Both (a) and (b) are averages over Sahel. (c) Temperature (color shading) and vertical velocity (contours) anomalies normalized by their interannual variability during summer 2000-2018 over West Africa.

- Increasing trend in surface precipitation over Sahel contrasts a decreasing trend over Guinea Coast in West Africa.
- Precipitation increase over Sahel is due to an increase in extreme deep convection penetrating the tropical tropopause layer (TTL).
- Recent decadal change in convective activity occurred in association with a cooling (warming) in the tropical stratosphere (troposphere) indicative of a destabilization of the TTL.