



AMS
American Meteorological Society

Supplemental Material

© [Copyright 2023 American Meteorological Society](#) (AMS)

For permission to reuse any portion of this work, please contact permissions@ametsoc.org. Any use of material in this work that is determined to be “fair use” under Section 107 of the U.S. Copyright Act (17 USC §107) or that satisfies the conditions specified in Section 108 of the U.S. Copyright Act (17 USC §108) does not require AMS’s permission. Republication, systematic reproduction, posting in electronic form, such as on a website or in a searchable database, or other uses of this material, except as exempted by the above statement, requires written permission or a license from AMS. All AMS journals and monograph publications are registered with the Copyright Clearance Center (<https://www.copyright.com>). Additional details are provided in the AMS Copyright Policy statement, available on the AMS website (<https://www.ametsoc.org/PUBSCopyrightPolicy>).

1 **Supplemental Material for “On the impact of a dry intrusion driving**
2 **cloud-regime transitions in a midlatitude cold-air outbreak”**

3 Florian Tornow,^{a,b} Andrew S. Ackerman,^b Ann M. Fridlind,^b George Tselioudis,^b Brian
4 Cairns,^b David Painemal,^{c,d} Gregory Elsaesser^{e,b}

5 ^a *Earth Institute, Columbia University, NY 10025, NY, USA*

6 ^b *NASA Goddard Institute for Space Studies, NY 10025, NY, USA*

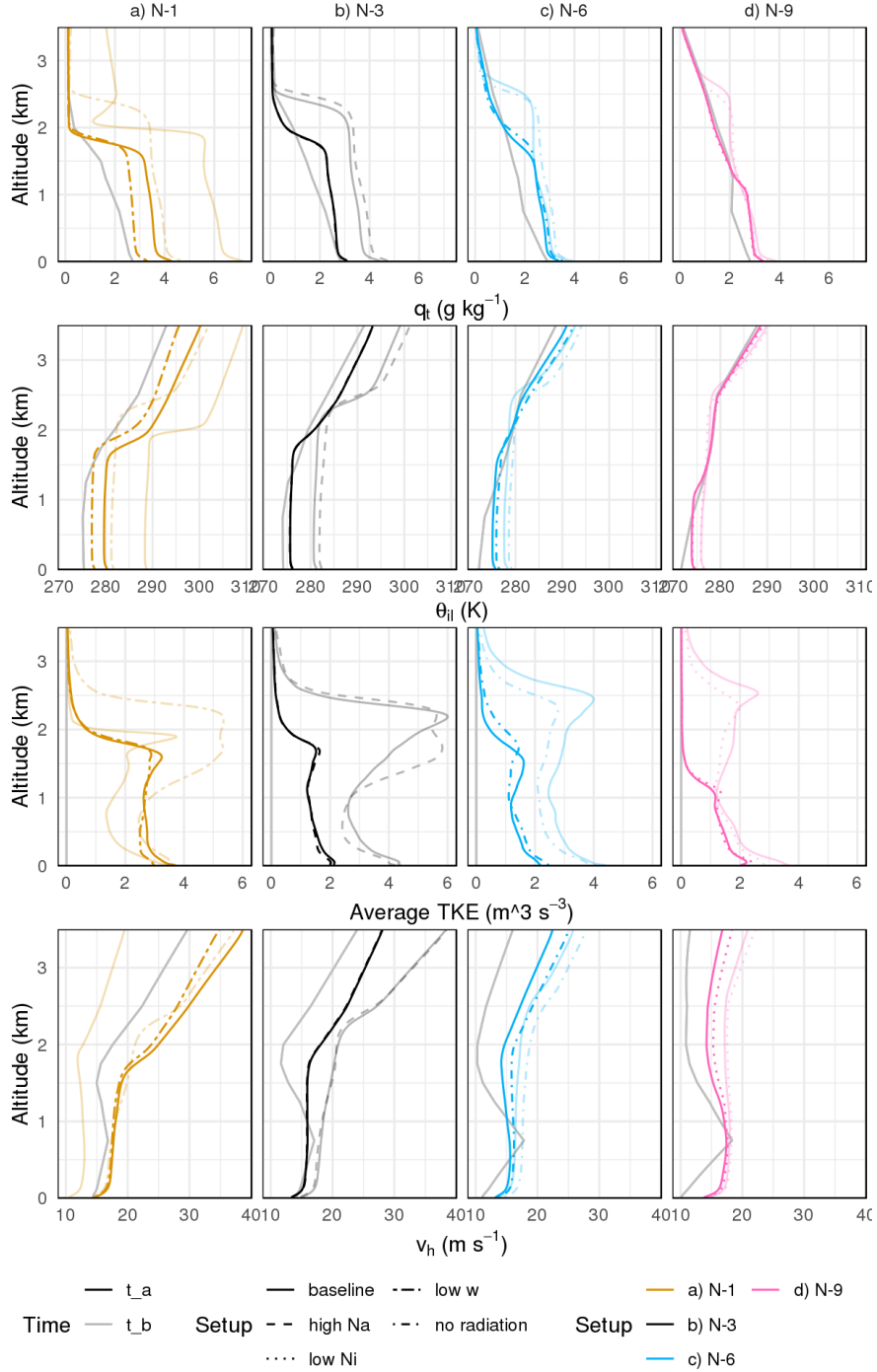
7 ^c *NASA Langley Research Center, Hampton, VA 23681, USA*

8 ^d *Science, Systems, and Applications, Inc., Hampton, VA 23681, USA*

9 ^e *Department of Applied Physics and Applied Mathematics, Columbia University, NY 10027, NY,*

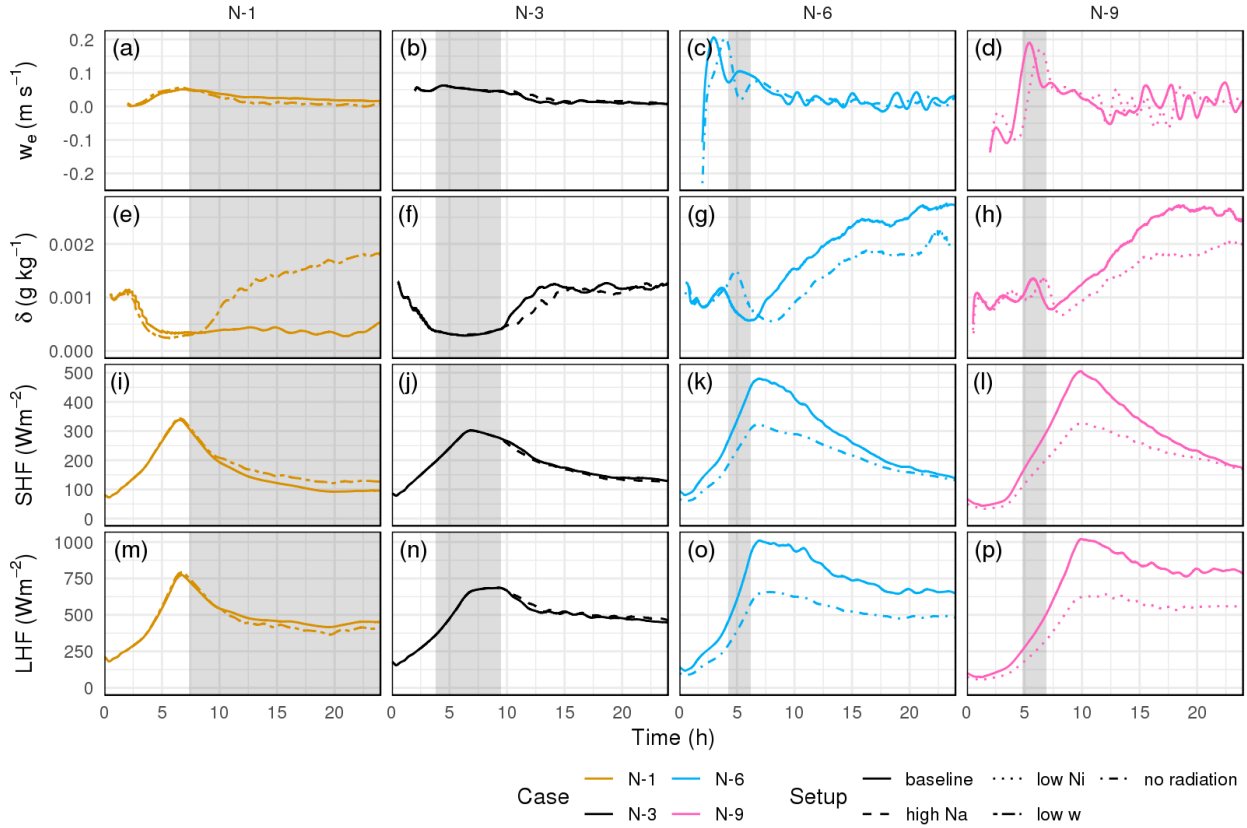
10 *USA*

Profiles at Cloud Formation and Rain Onset



13 FIG. 1. Similar to Figure 5. Profiles of total water mixing ratio, liquid-ice potential temperature, turbulent
 14 kinetic energy, and wind speed (from top to bottom), shown for two three steps: cloud formation, t_a , onset
 15 of substantial precipitation, t_b , (marked by different line transparencies and case-specific colors) and initial
 16 conditions (gray lines).

Evolution of Entrainment, Stratification, and Surface Fluxes



17 FIG. 2. Similar to Figure 5, we show timeseries of entrainment rates, MBL stratification, and surface sensible
 18 and latent heat fluxes (from top to bottom).

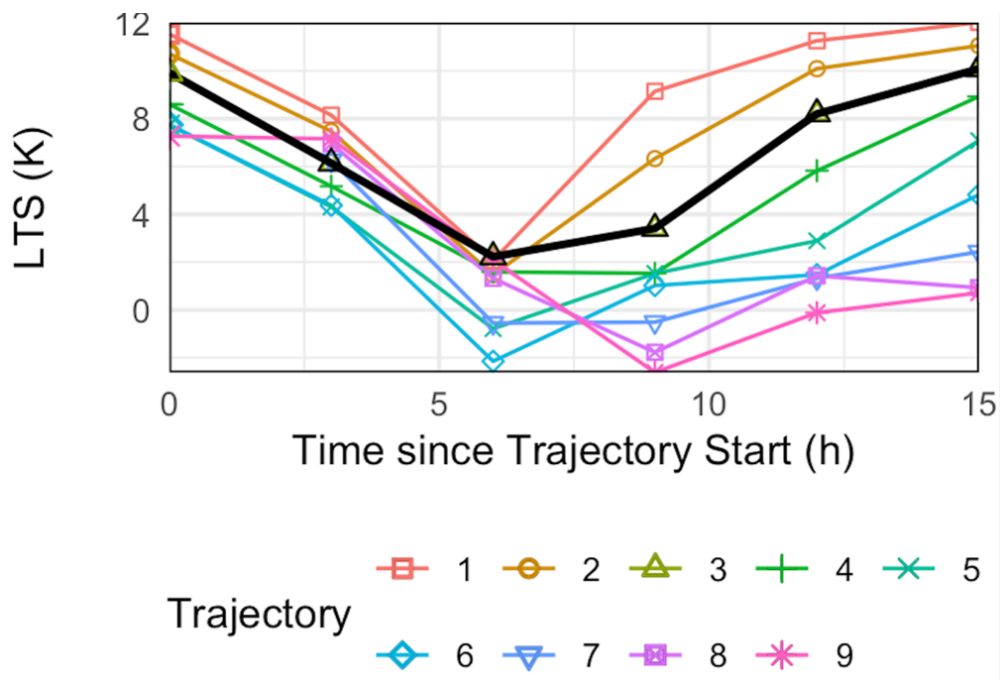
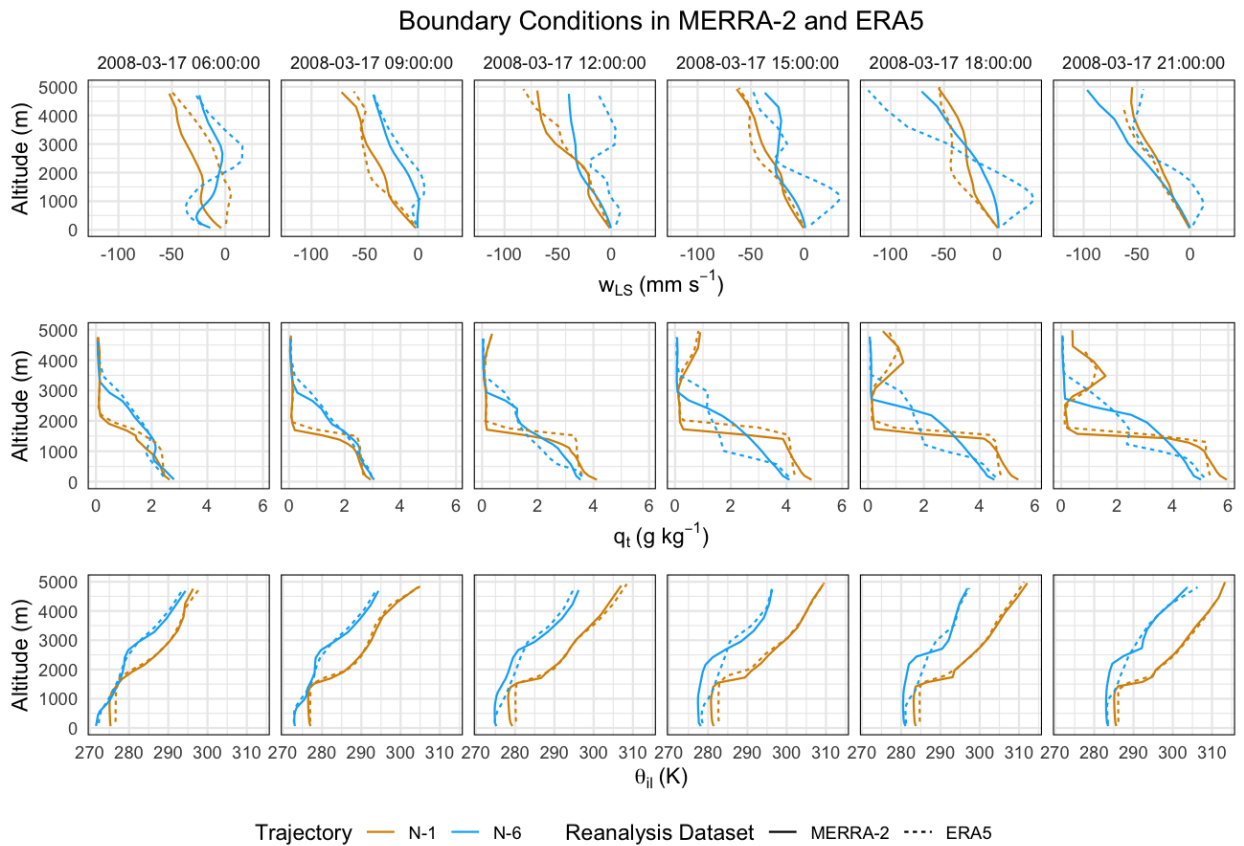


FIG. 3. Similar to Fig. 4, here using the conventional definition of LTS.



19 FIG. 4. For selected timesteps (left to right) and two trajectories (color), we compare profiles of large-scale
 20 vertical wind (top), total water mixing ratio (middle), and liquid-ice-water potential temperature (bottom).