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*Supplement of*

## **Investigating the source, transport, and isotope composition of water vapor in the planetary boundary layer**

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## WPS Domain Configuration

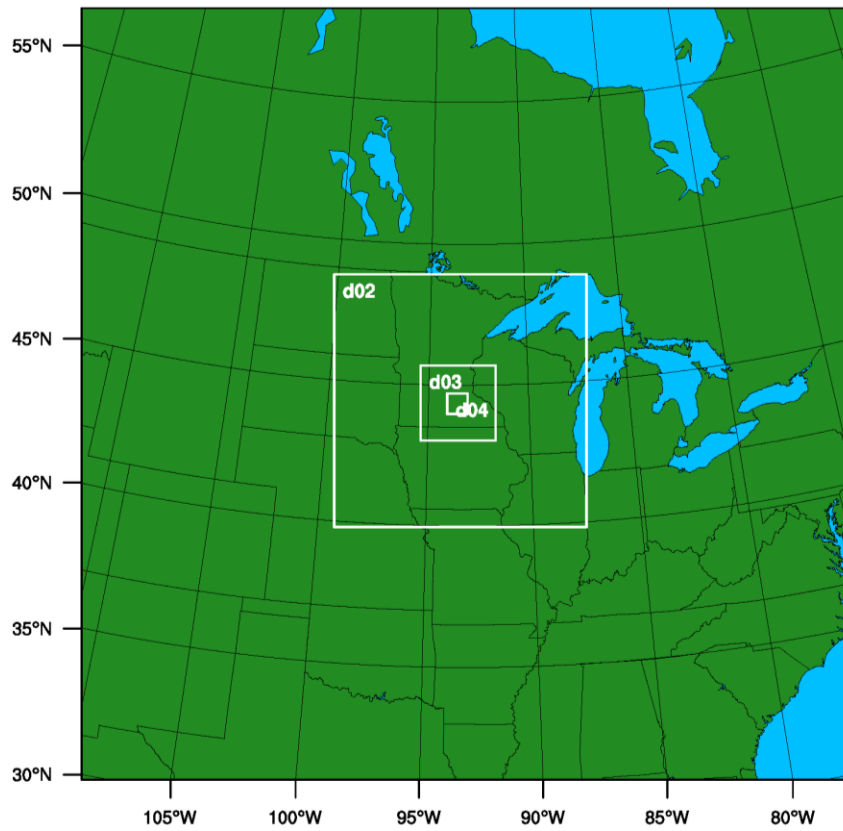


Figure S1. Illustration of the four nested domains employed in WRF3.5 using a recommended 3:1 ratio for the inner domains.

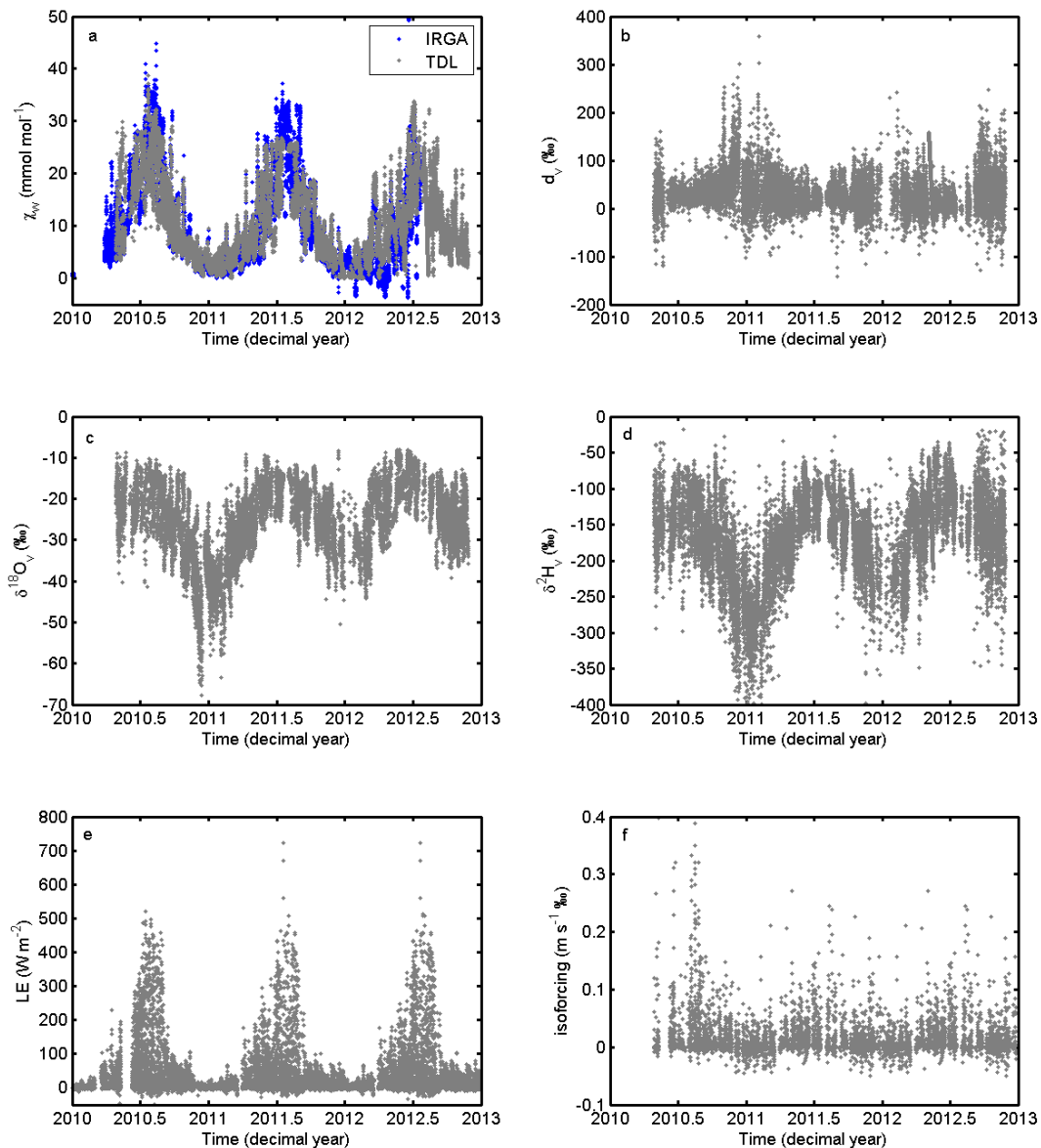


Figure S2. Time series of water vapor observations at the University of Minnesota tall tower Observatory from 2010 to 2013. a) Hourly water vapor mixing ratios measured at 185 m using an IRGA (LI-7000, Licor Inc., Nebraska, USA) and an isotope TDL system (TGA200, Campbell Scientific Inc. Logan, Utah, USA); b) Hourly deuterium excess measured at 185 m; c) Hourly oxygen isotope composition of water vapor measured at 185 m; d) Hourly deuterium isotope composition of water vapor measured at 185 m; e) Hourly latent heat flux measured at AmeriFlux Site US-Ro1, which is located within the tall tower footprint; and f) Hourly isoforcing associated with surface evaporation measured at the tall tower.

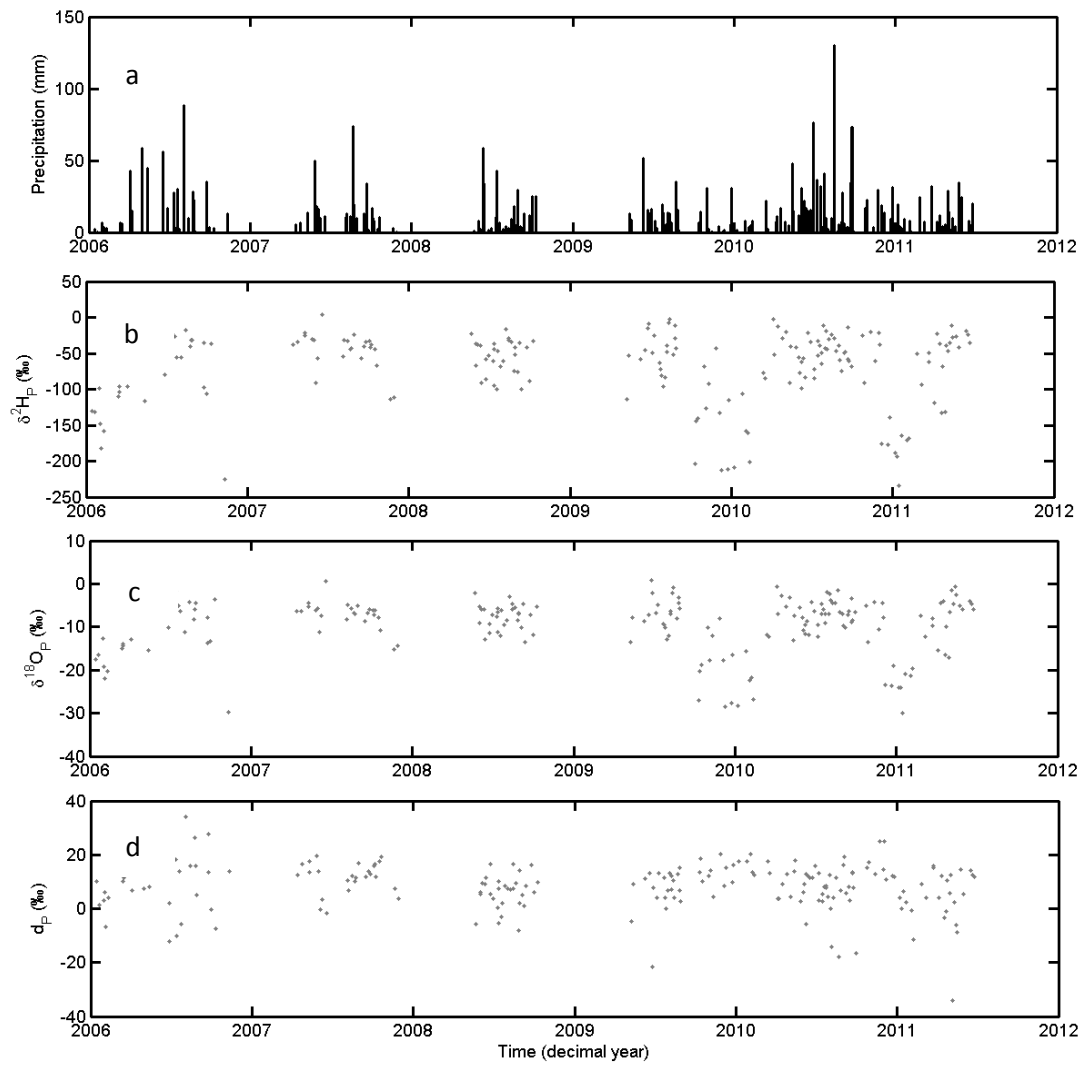


Figure S3. Time series of a) precipitation measured near the tall tower facility; b) deuterium isotope composition of precipitation; c) oxygen isotope composition of precipitation; d) deuterium excess of precipitation.

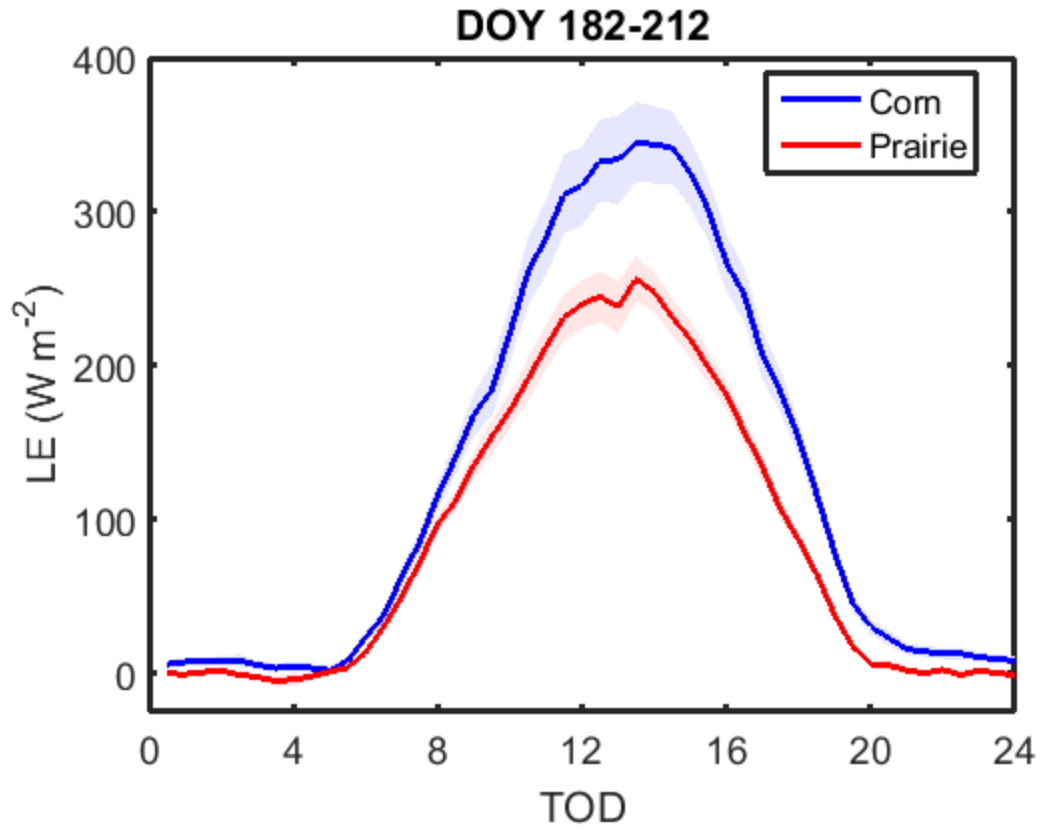


Figure S4. Comparison of latent heat flux measured with the eddy covariance approach over a corn canopy and prairie site within the source footprint of the University of Minnesota tall tower.

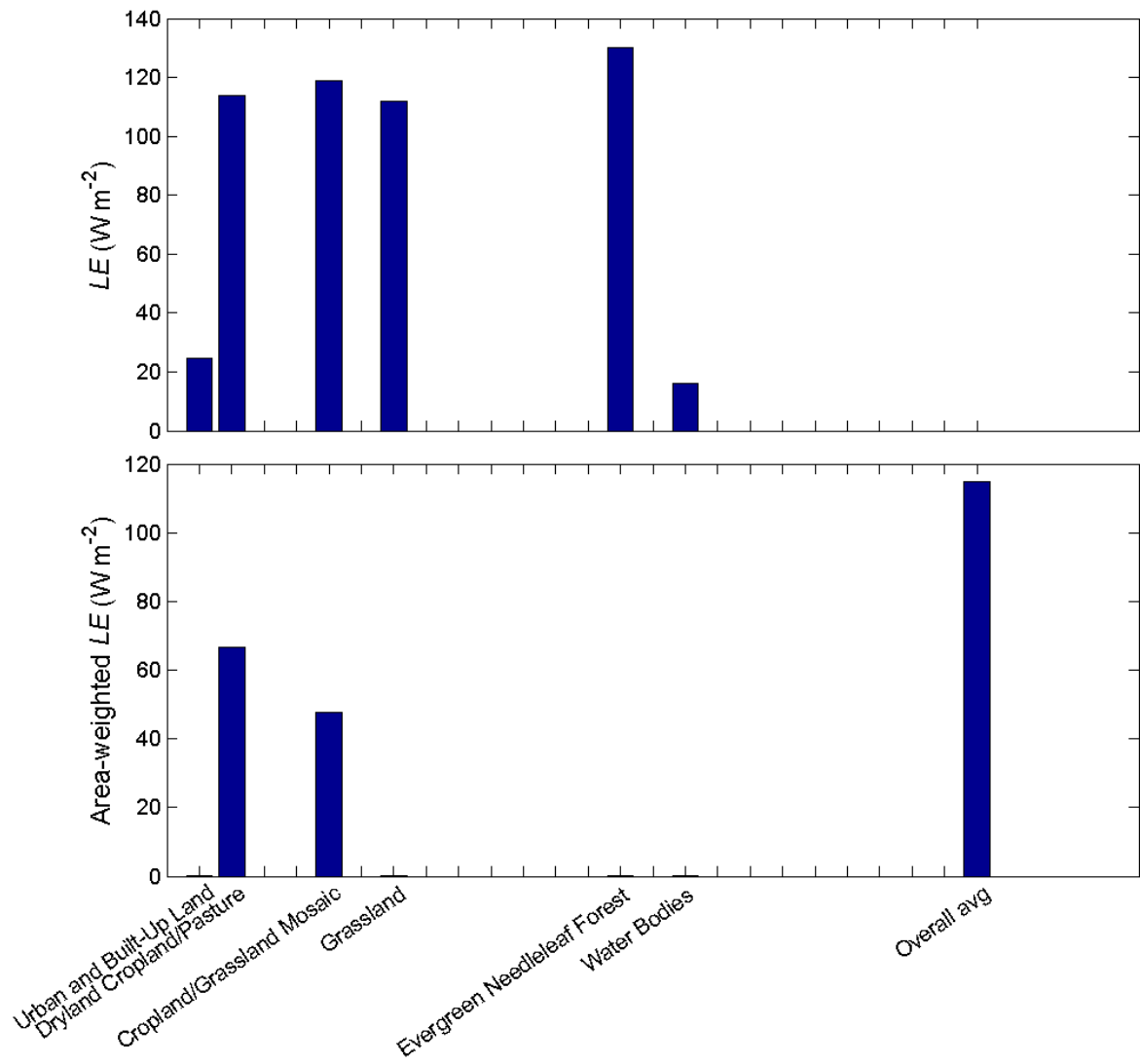


Figure S5. Simulated latent heat flux densities using the Weather Research and Forecast model with the land surface scheme NOAH for the growing seasons 2008-2011. The lower panel shows the area-weighted latent heat flux density of the study domain.

## Example of a Namelist File for WRF3.5 Simulations

```
&time_control
run_days      = 30,
run_hours     = 0,
run_minutes   = 0,
run_seconds   = 0,
start_year    = 2010, 2010, 2010, 2010,
start_month   = 07, 07, 07, 07,
start_day     = 01, 01, 01, 01,
start_hour    = 00, 00, 00, 00,
start_minute  = 00, 00, 00, 00,
start_second  = 00, 00, 00, 00,
end_year      = 2010, 2010, 2010, 2010,
end_month     = 07, 07, 07, 07,
end_day       = 30, 30, 30, 30,
end_hour      = 00, 00, 00, 00,
end_minute    = 00, 00, 00, 00,
end_second    = 00, 00, 00, 00,
interval_seconds = 21600,
input_from_file = .true., .true., .true., .true.,
history_interval = 60, 60, 60, 60,
frames_per_outfile = 1000, 1000, 1000, 1000,
restart       = .false.,
restart_interval = 5760,
io_form_history = 2,
io_form_restart = 2,
io_form_input = 2,
io_form_boundary = 2,
debug_level   = 0,
/
```

```
&domains
time_step      = 180,
time_step_fract_num = 0,
time_step_fract_den = 1,
max_dom        = 4,
e_we           = 114, 112, 100, 82,
e_sn           = 114, 112, 100, 82,
e_vert         = 28, 28, 28, 28,
p_top_requested = 5000,
num_metgrid_levels = 27,
num_metgrid_soil_levels = 4,
max_dz         = 1500,
dx             = 27000, 9000, 3000, 1000,
dy             = 27000, 9000, 3000, 1000,
grid_id        = 1, 2, 3, 4,
parent_id      = 1, 1, 2, 3,
i_parent_start = 1, 38, 39, 36,
j_parent_start = 1, 38, 39, 36,
parent_grid_ratio = 1, 3, 3, 3,
parent_time_step_ratio = 1, 3, 3, 3,
feedback       = 1,
smooth_option  = 0,
/
```

```
&physics
mp_physics     = 3, 3, 3, 3,
ra_lw_physics  = 1, 1, 1, 1,
ra_sw_physics  = 1, 1, 1, 1,
radt           = 30, 30, 30, 30,
sf_sfclay_physics = 1, 1, 1, 1,
```

```

sf_surface_physics    = 5,    5,    5,    5,
bl_pbl_physics       = 1,    1,    1,    1,
bldt                 = 0,    0,    0,    0,
cu_physics           = 1,    1,    0,    0,
cudt                 = 5,    5,    5,    5,
isfflx               = 1,
ifsnow               = 0,
icloud               = 1,
surface_input_source = 1,
num_soil_layers      = 10,
sf_urban_physics     = 0,    0,    0,    0,
maxiens              = 1,
maxens               = 3,
maxens2              = 3,
maxens3              = 16,
ensdim               = 144,
/

&fdda
/

&dynamics
w_damping            = 0,
diff_opt             = 1,
km_opt               = 4,
diff_6th_opt         = 0,    0,    0,    0,
diff_6th_factor      = 0.12, 0.12, 0.12, 0.12,
base_temp            = 290.,
damp_opt             = 0,
zdamp                = 5000., 5000., 5000., 5000.,
dampcoef             = 0.2, 0.2, 0.2, 0.2,
khdif                = 0,    0,    0,    0,
kvdif                = 0,    0,    0,    0,
non_hydrostatic      = .true., .true., .true., .true.,
moist_adv_opt        = 1,    1,    1,    1,
scalar_adv_opt       = 1,    1,    1,    1,
/

&bdy_control
spec_bdy_width       = 5,
spec_zone            = 1,
relax_zone           = 4,
specified            = .true., .false., .false., .false.,
nested               = .false., .true., .true., .true.,
/

&grib2
/

&namelist_quilt
nio_tasks_per_group = 0,
nio_groups           = 1,

```