

# Errors, biases, and corrections for weighing gauge precipitation measurements from the WMO Solid Precipitation Experiment

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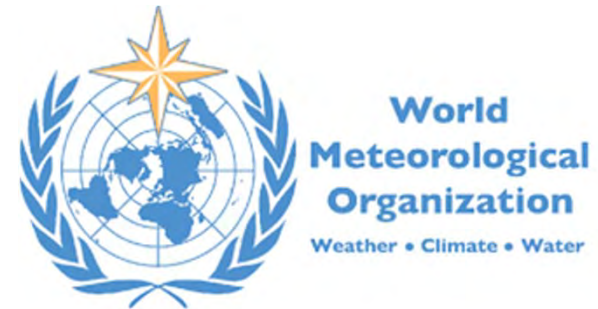
<sup>7</sup>Meteoswiss, Payerne, Switzerland

<sup>8</sup>Environment Canada, Climate Research Division, Saskatoon, Canada

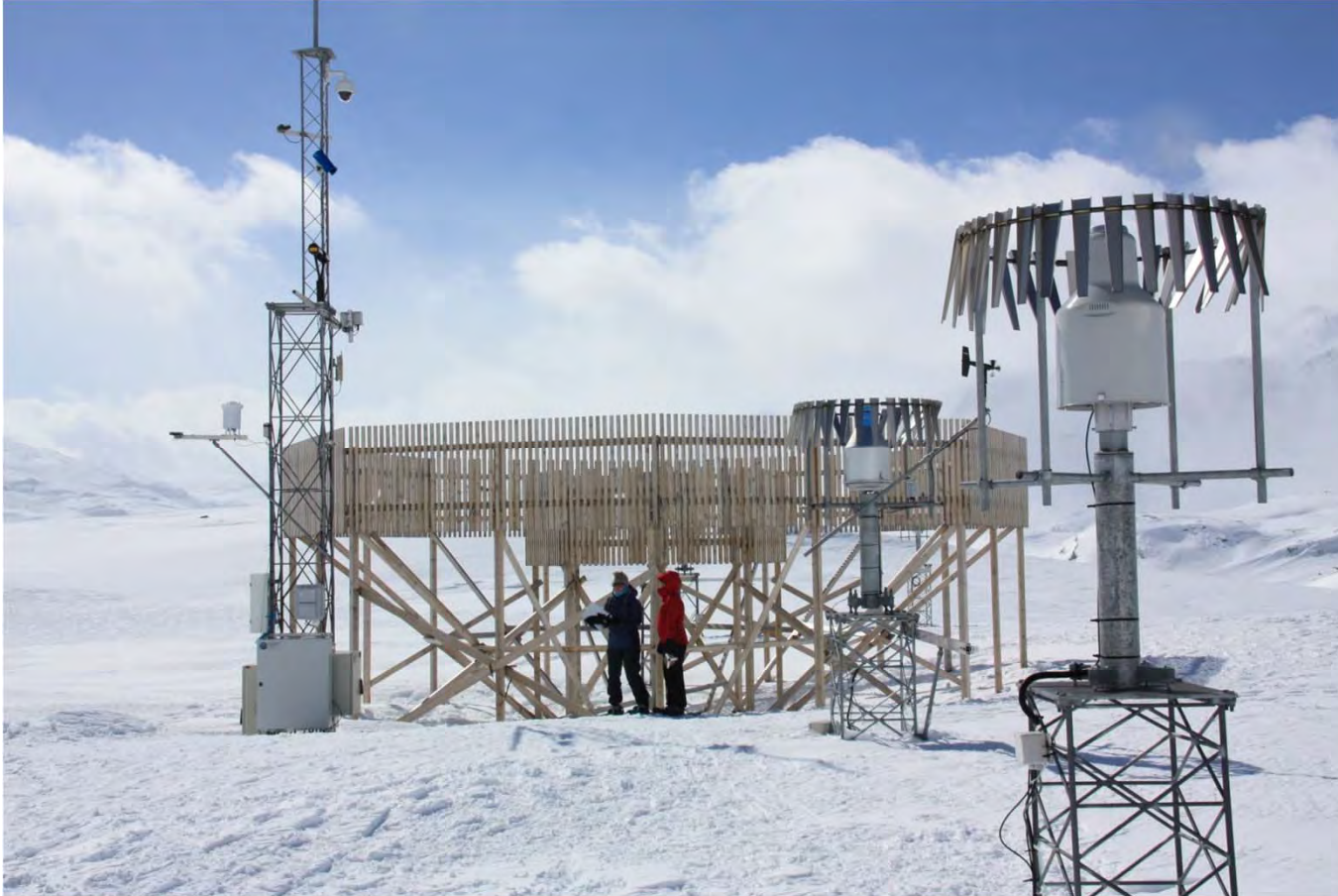
<sup>9</sup>Delegación Territorial de AEMET en Aragón, Zaragoza, Spain

<sup>10</sup>Finnish Meteorological Institute, Helsinki, Finland

<sup>11</sup>Kyungpook National University, Daegu, Korea

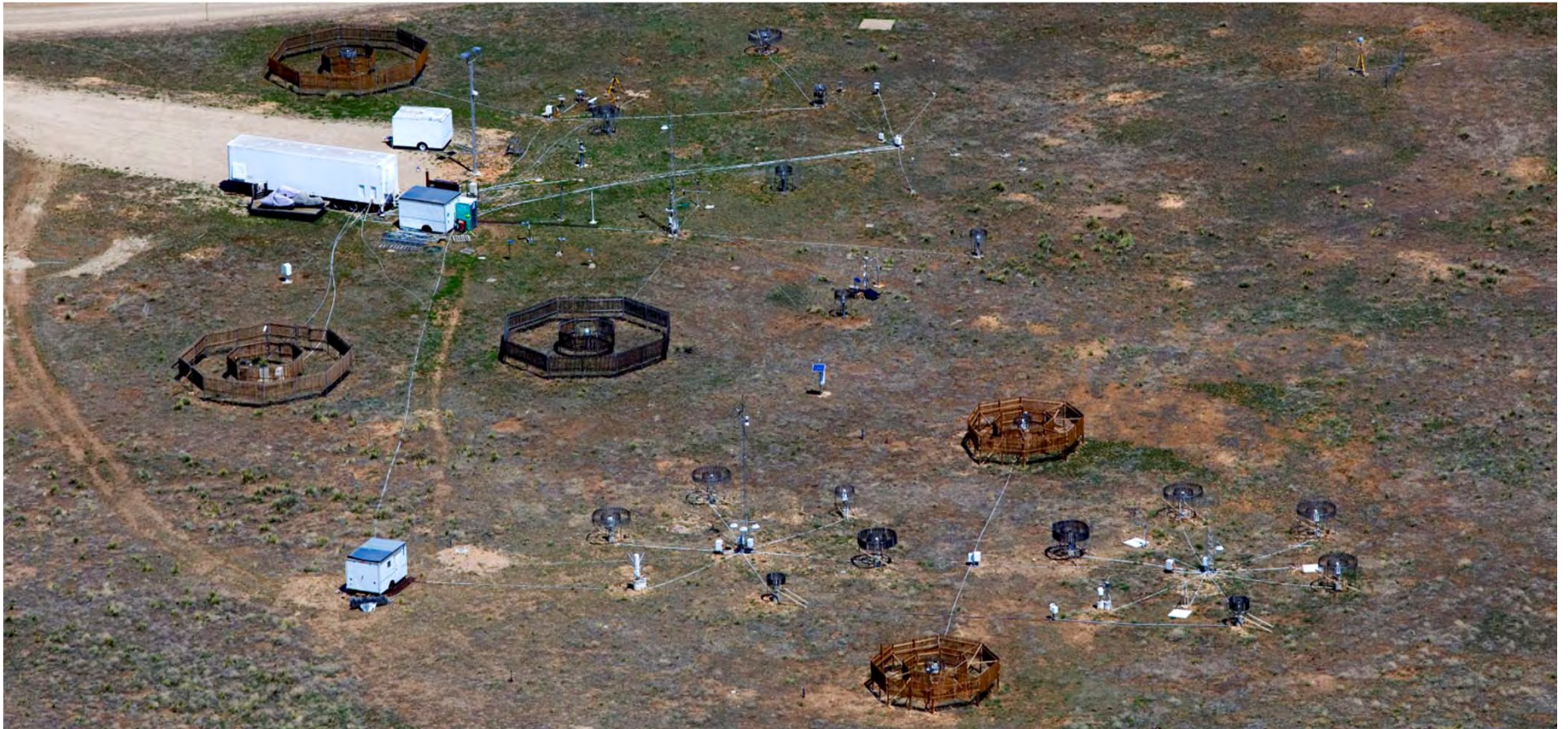


## An Example Testbed (Norway)

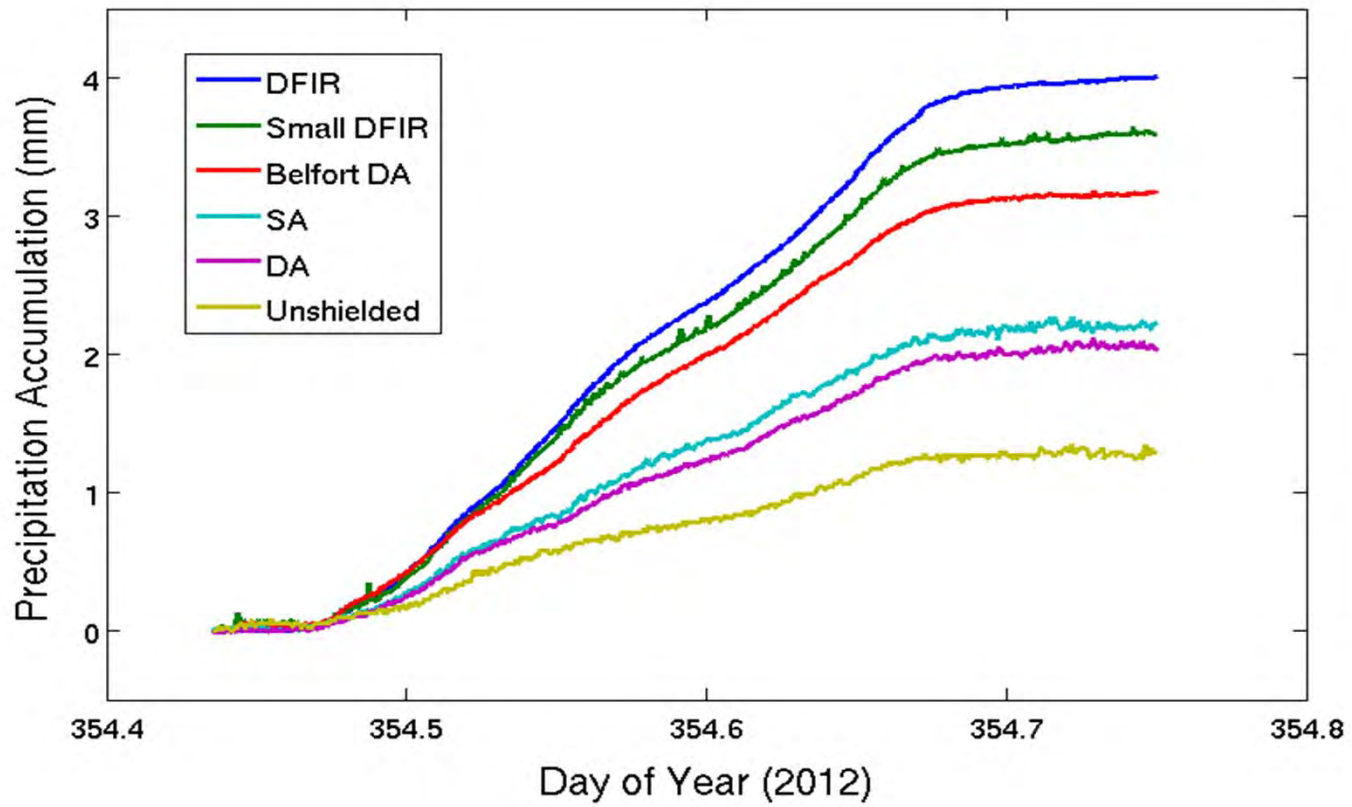




# Another Example Testbed (USA)

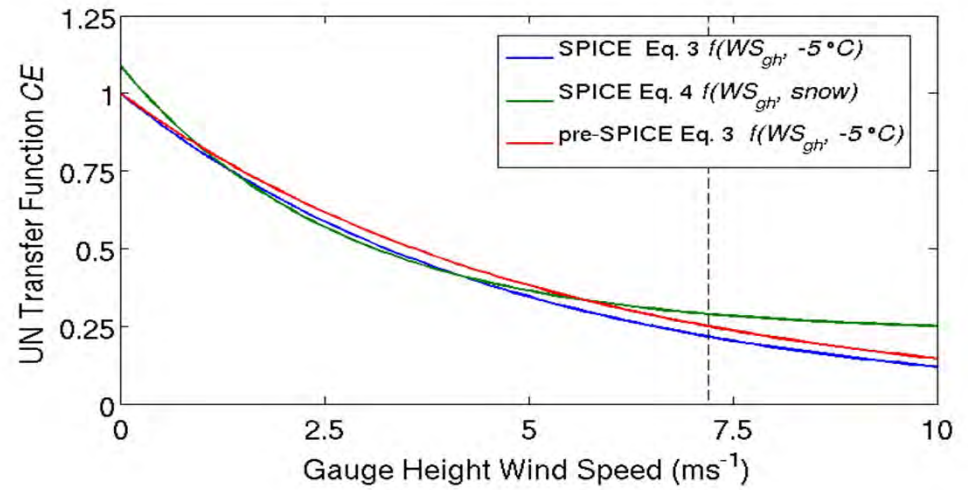


## Example Event (USA)

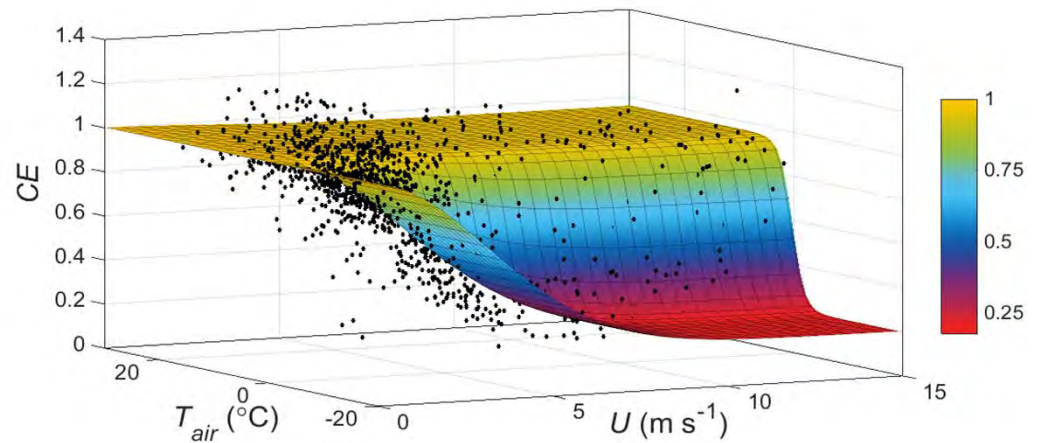


# Example Transfer Functions

$$CE = f(U)$$



$$CE = f(U, T_{air})$$



## What type of function works best?

$$CE = e^{-a(U)(1 - [\tan^{-1}(b(T_{air})) + c])} \quad (3)$$

$$CE = (a)e^{-b(U)} + c \quad (4)$$

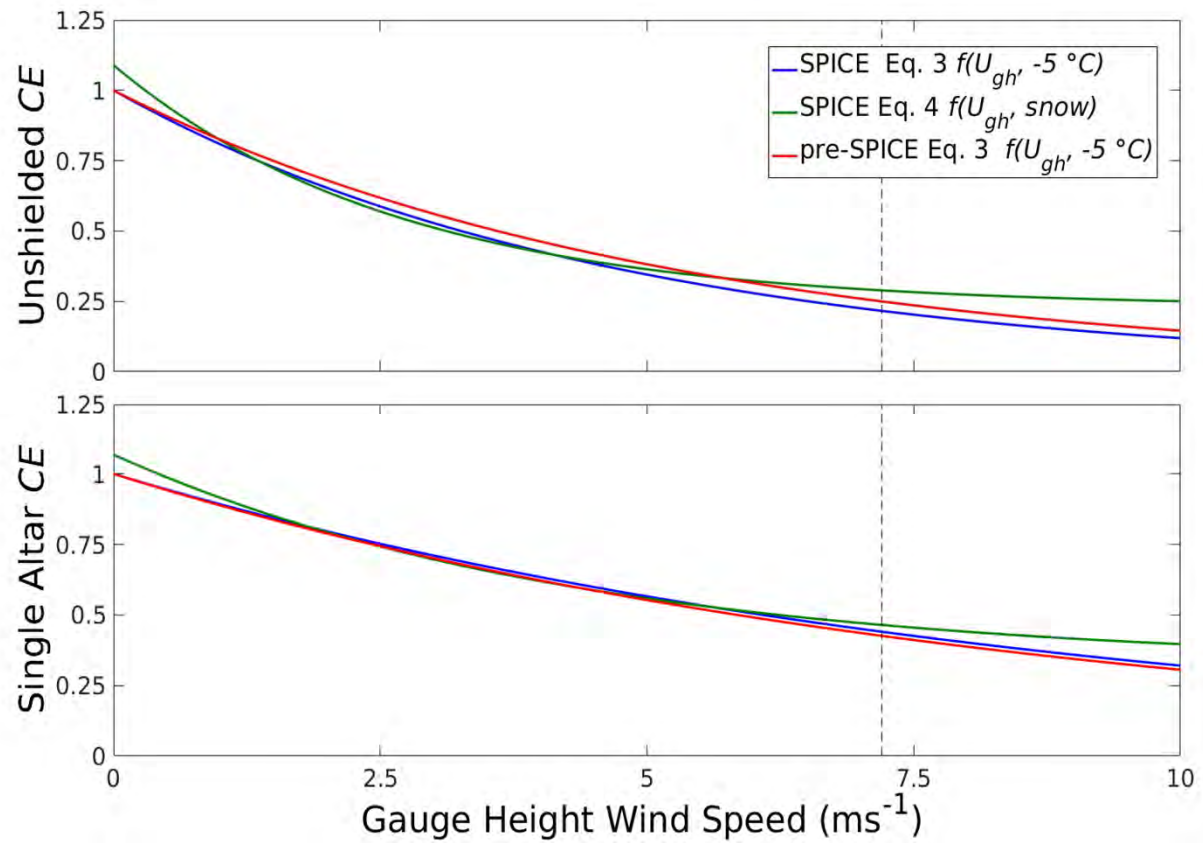
- $U$  is wind speed,  $T_{air}$  is air temperature, and  $a$ ,  $b$ , and  $c$  are coefficients
- Eq. 4 is defined separately for liquid, mixed, and solid precipitation



## Sites with reference DFIR, unshielded, and SA measurements

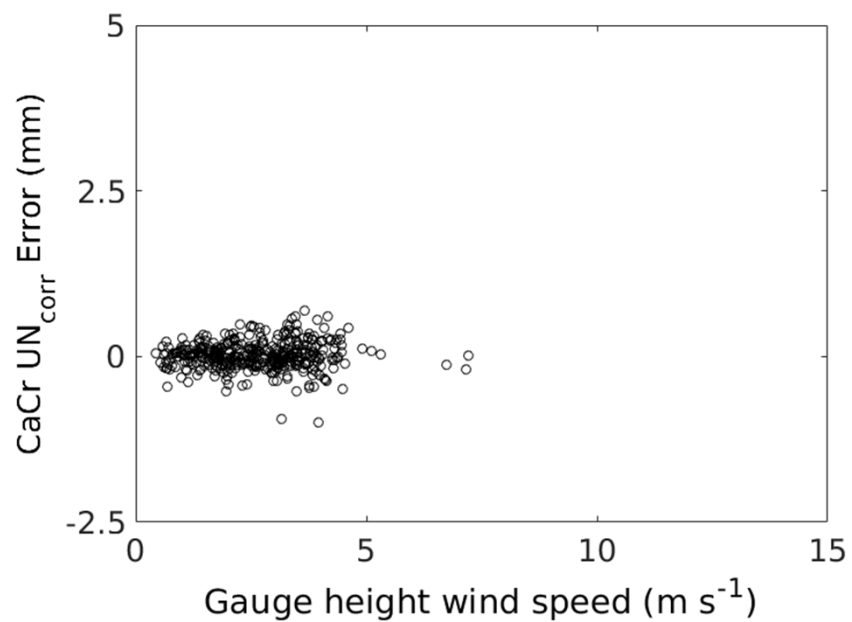
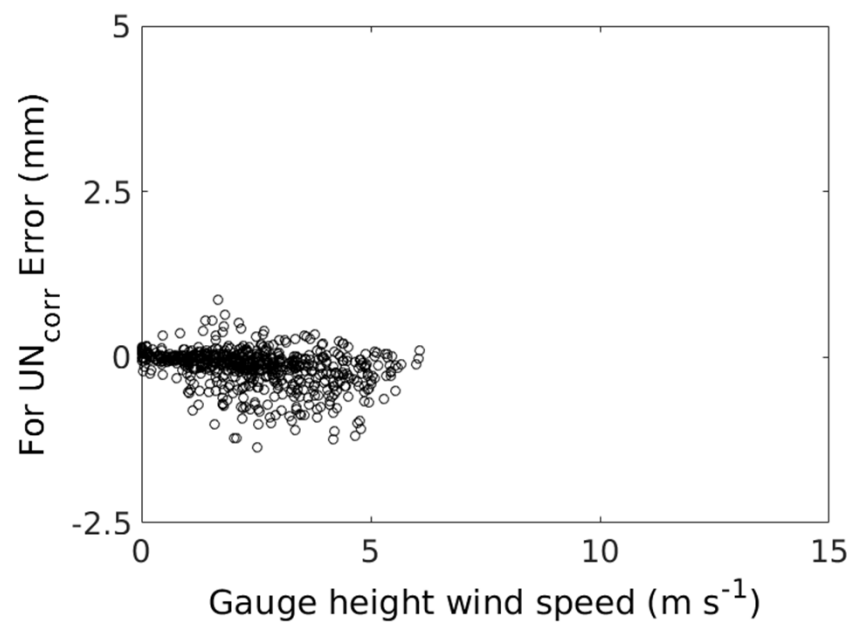
| Site          | Country     | Abbr  | Elev.  | Lat.   | Mean $U_{gh}$        | Max $U_{gh}$          | Mean $T_{air}$ | $N_{UN}$ | $N_{SA}$ |
|---------------|-------------|-------|--------|--------|----------------------|-----------------------|----------------|----------|----------|
| CARE          | Canada      | Care  | 251 m  | 44.23° | 3.2 ms <sup>-1</sup> | 8.2 ms <sup>-1</sup>  | -3.3 °C        | 484      | 364      |
| Haukeliseter  | Norway      | Hauk  | 991 m  | 59.81° | 6.7 ms <sup>-1</sup> | 20.6 ms <sup>-1</sup> | -1.7 °C        | 565      | 635      |
| Sodankyla     | Finland     | Sod   | 179 m  | 67.37° | 1.6 ms <sup>-1</sup> | 4.0 ms <sup>-1</sup>  | -2.1 °C        | 507      | 507      |
| Caribou Creek | Canada      | CaCr  | 519 m  | 53.94° | 2.6 ms <sup>-1</sup> | 7.2 ms <sup>-1</sup>  | -6.3 °C        | 413      | 388      |
| Weissfluhjoch | Switzerland | Weiss | 2537 m | 46.83° | 3.8 ms <sup>-1</sup> | 11.6 ms <sup>-1</sup> | -7.2 °C        | 508      | 537      |
| Formigal      | Spain       | For   | 1800 m | 42.76° | 2.3 ms <sup>-1</sup> | 6.0 ms <sup>-1</sup>  | -0.7 °C        | 669      | 656      |
| Marshall      | USA         | Ma    | 1742 m | 39.59° | 2.8 ms <sup>-1</sup> | 10.2 ms <sup>-1</sup> | -2.0 °C        | 466      | 459      |
| Bratt's Lake  | Canada      | BrLa  | 585 m  | 50.20° | 4.4 ms <sup>-1</sup> | 7.3 ms <sup>-1</sup>  | -1.5 °C        | 168      | 182      |

# Resultant transfer functions

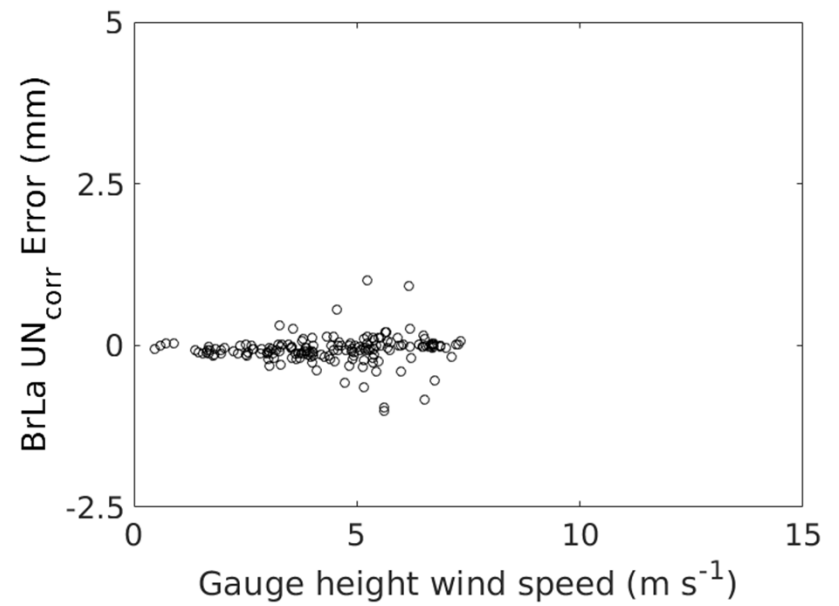
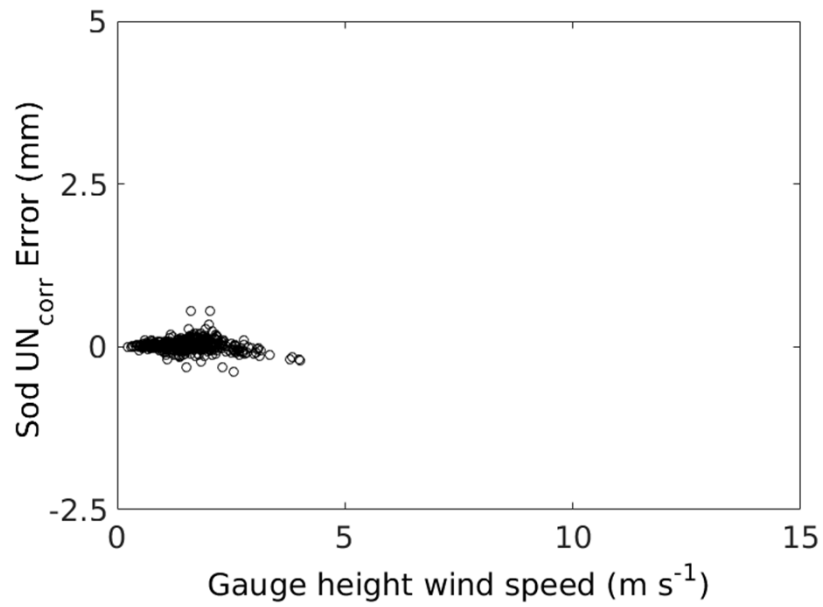




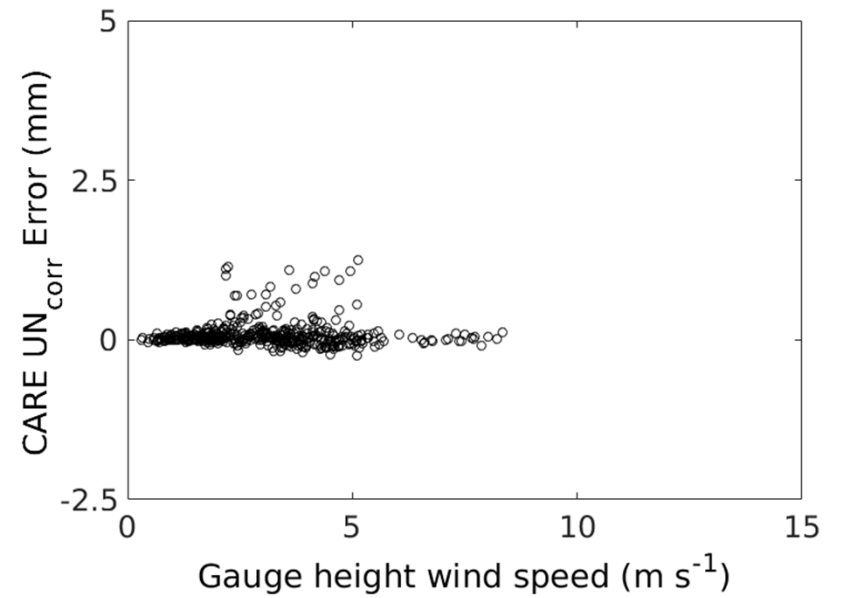
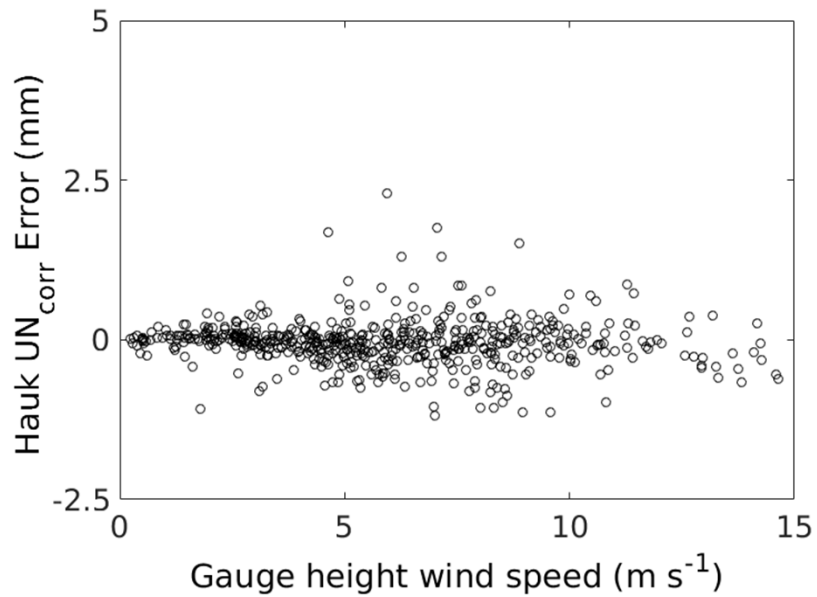
# Corrected Unshielded Results



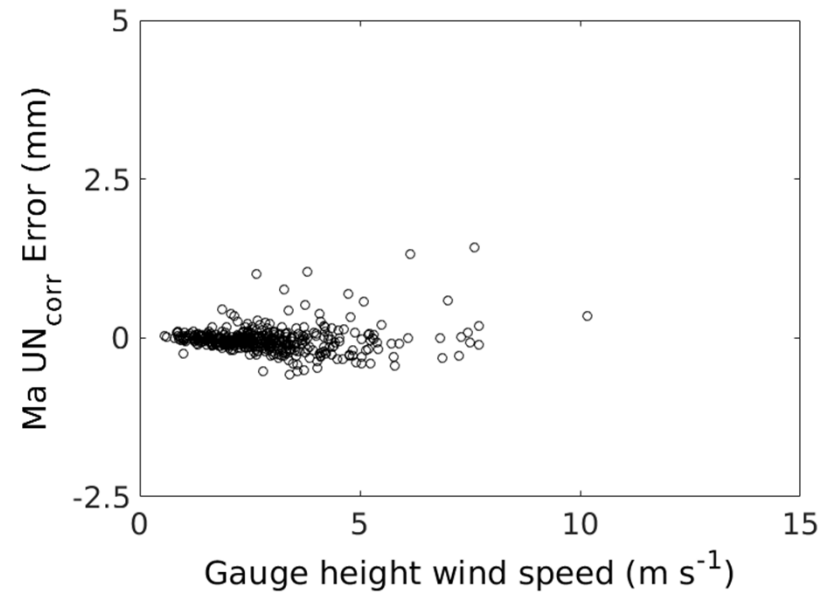
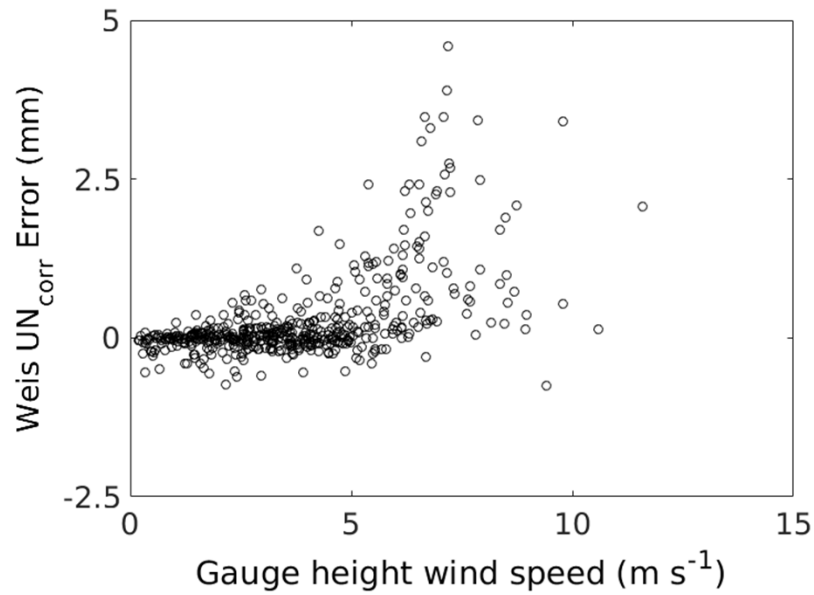
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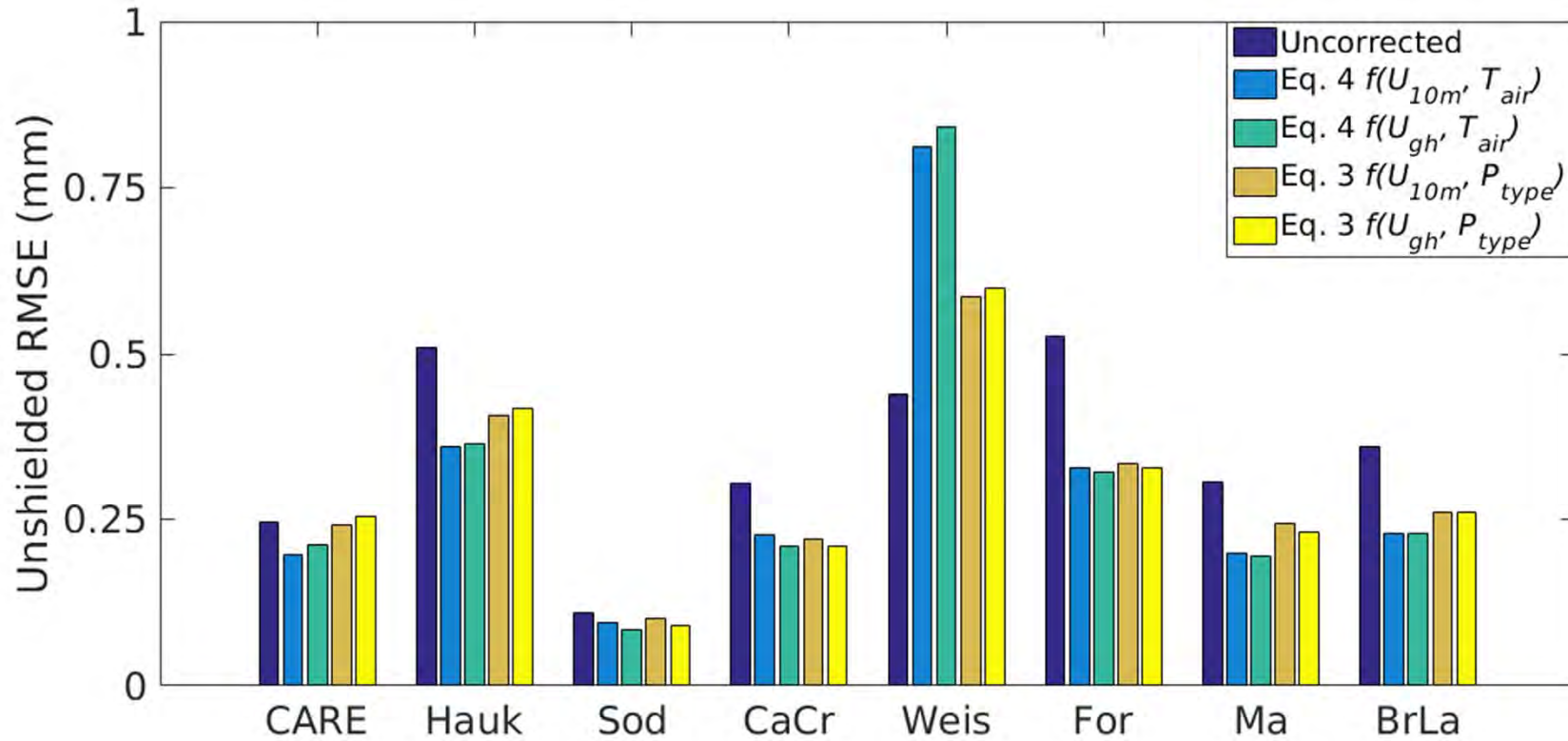
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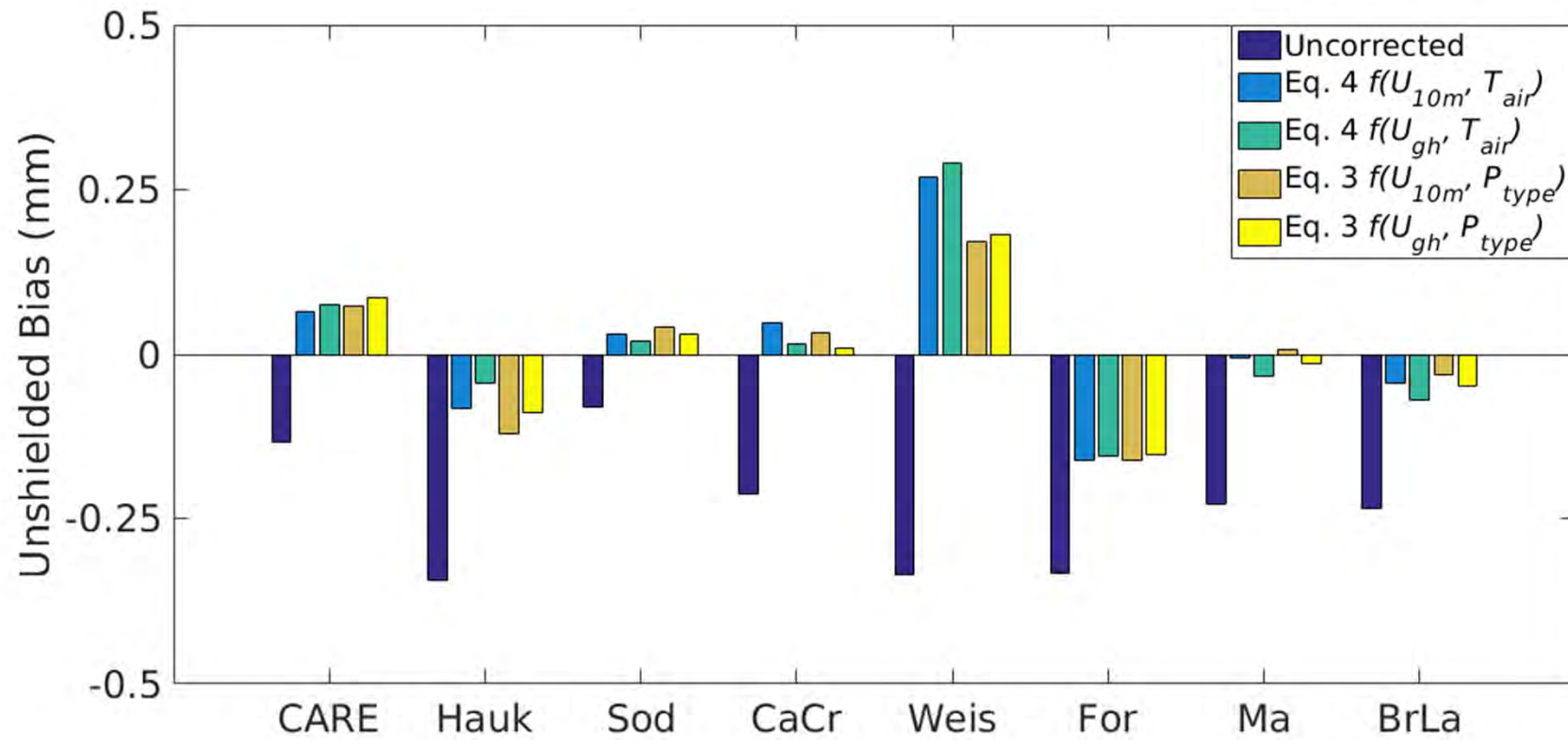


# Unshielded Results

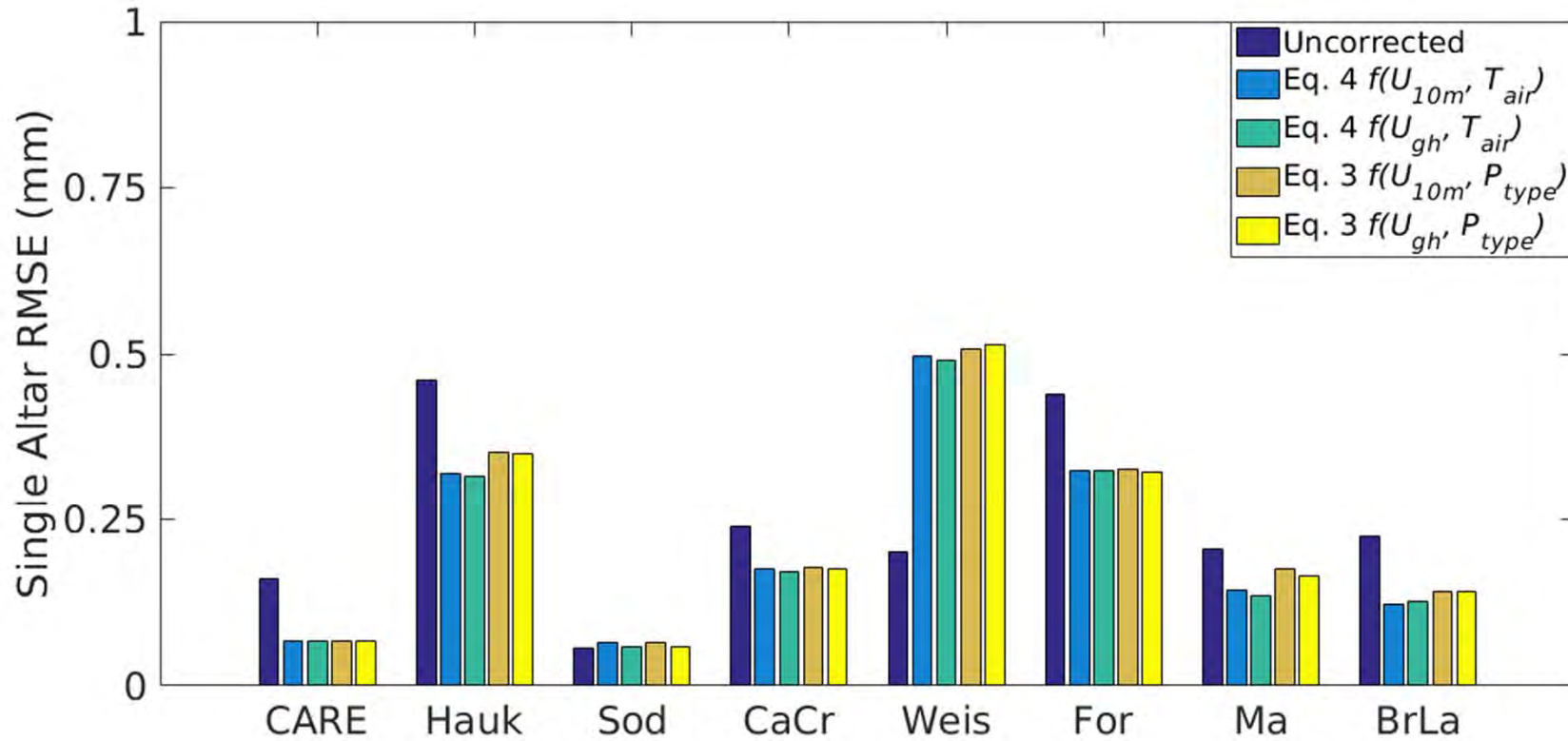




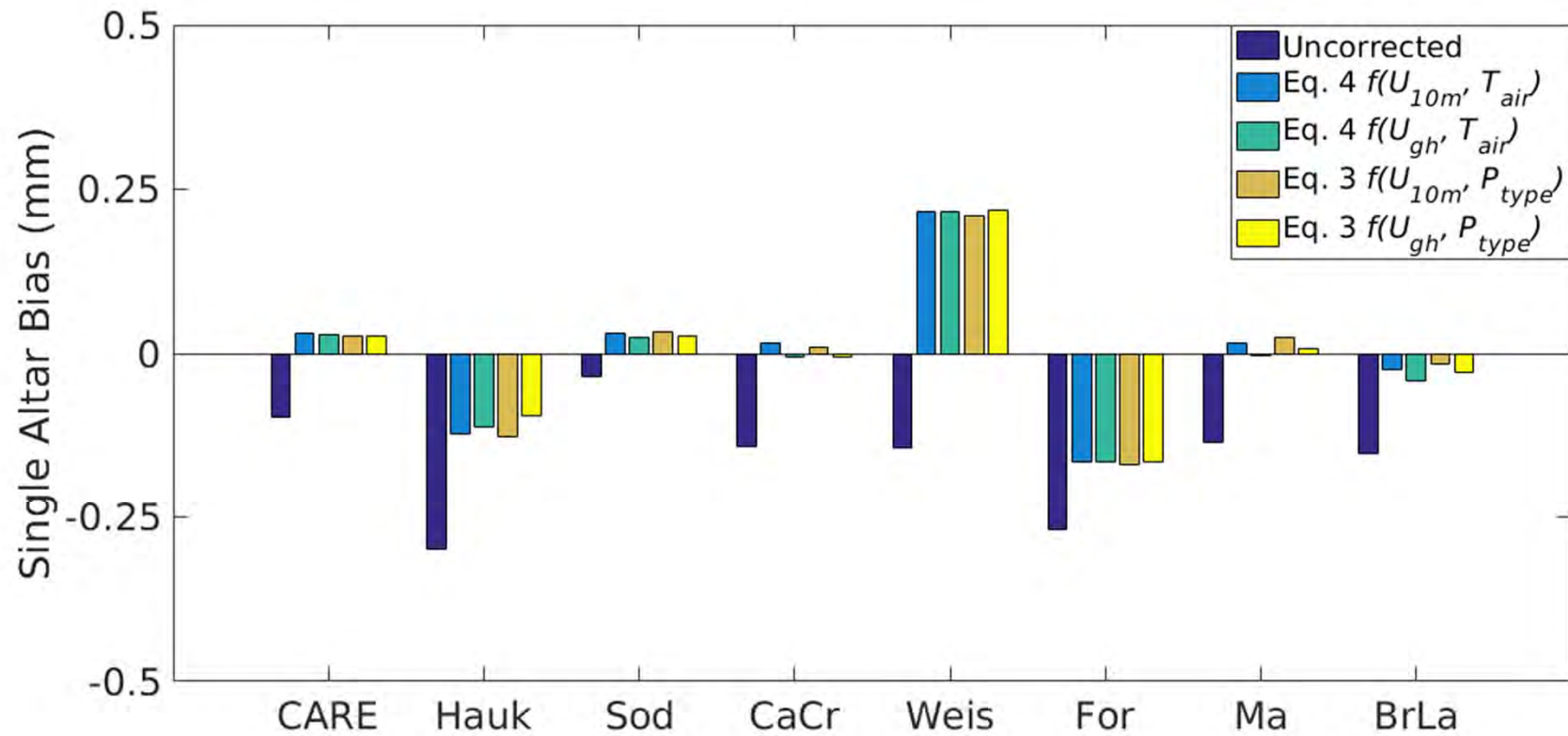
# Unshielded Results



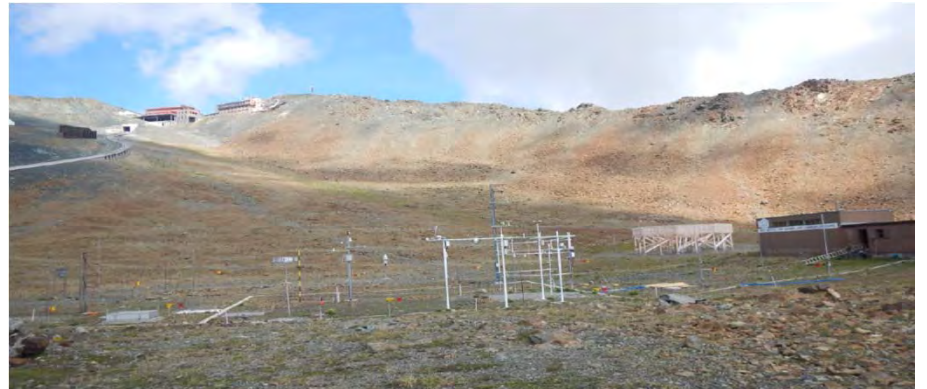
# Single Altar Results



# Single Altar Results



# Weissfluhjoch



# The End

