

Systematic Errors in Precipitation Measurements and Implications for Monitoring Drought



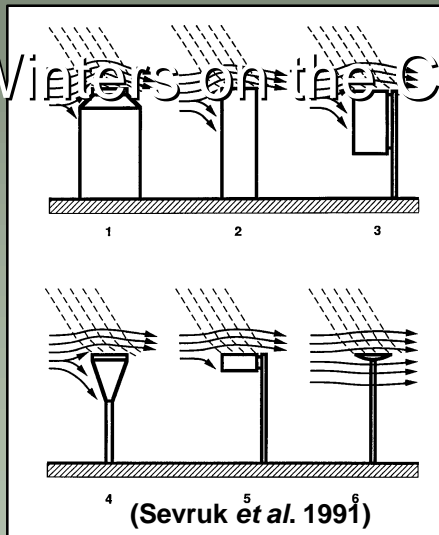
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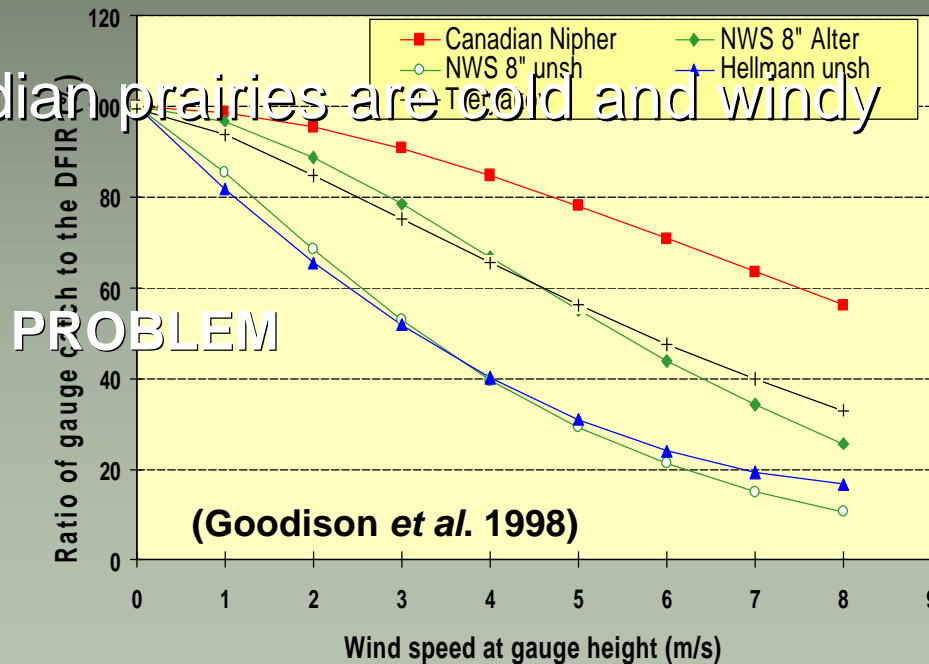
Background

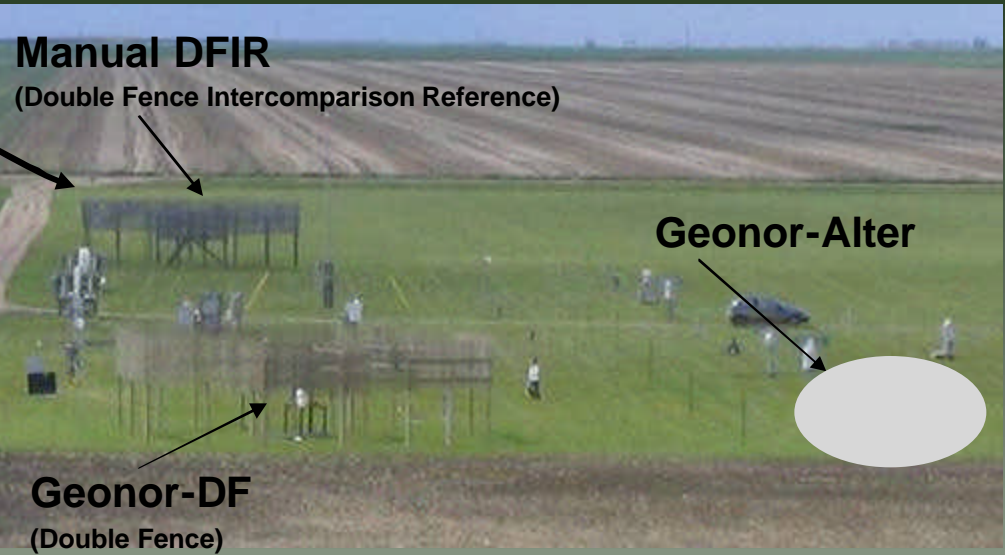
- Measuring precipitation is difficult!
- Measuring solid precipitation is even more difficult!!
- Largest environmental source of systematic error in solid precipitation measurement:

WIND



- Winters on the Canadian prairies are cold and windy



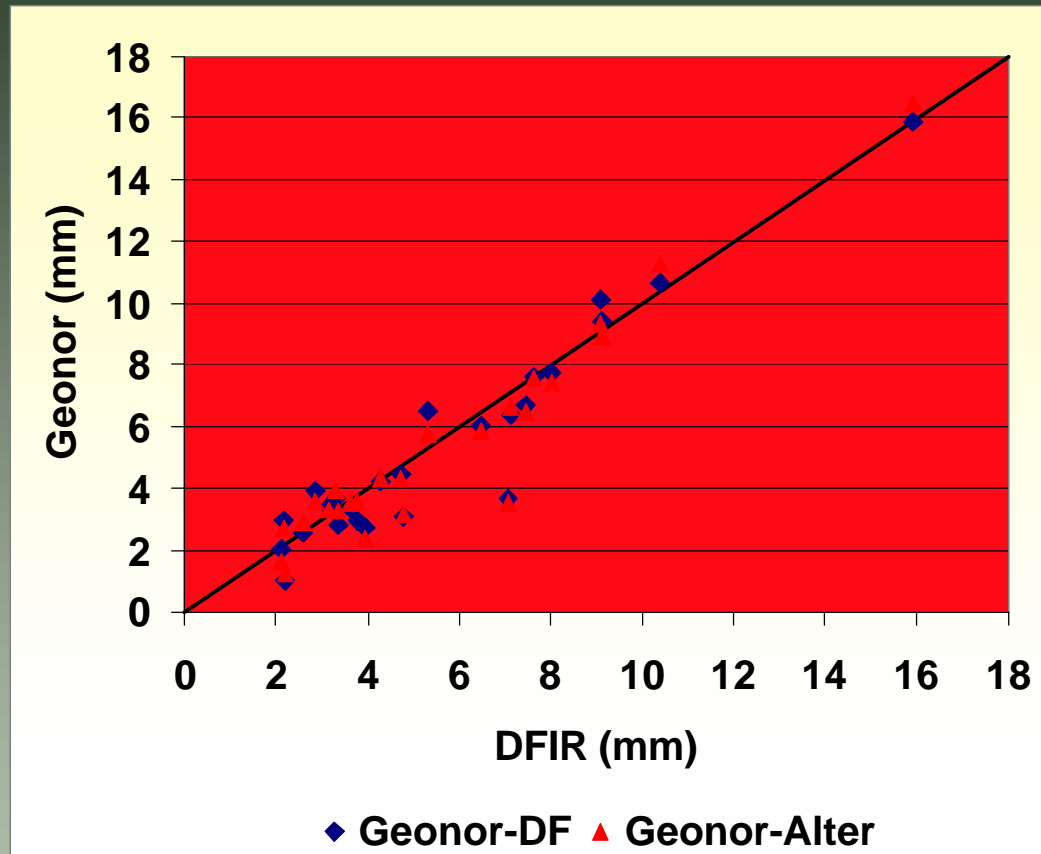


Methods

- RAIN or SNOW ...eliminated mixed precipitation
- Manual observations 1x or 2x daily
- Geonor 15-min observations accumulated to manual observation period
- Wind Speed at gauge height averaged over same period
- DFIR adjusted for wind as compared to bush gauge according to Yang *et al.* (1993)
- Intercomparison:
 - ◆ DFIR and Geonor-DF
 - ▲ DFIR and Geonor-Alter

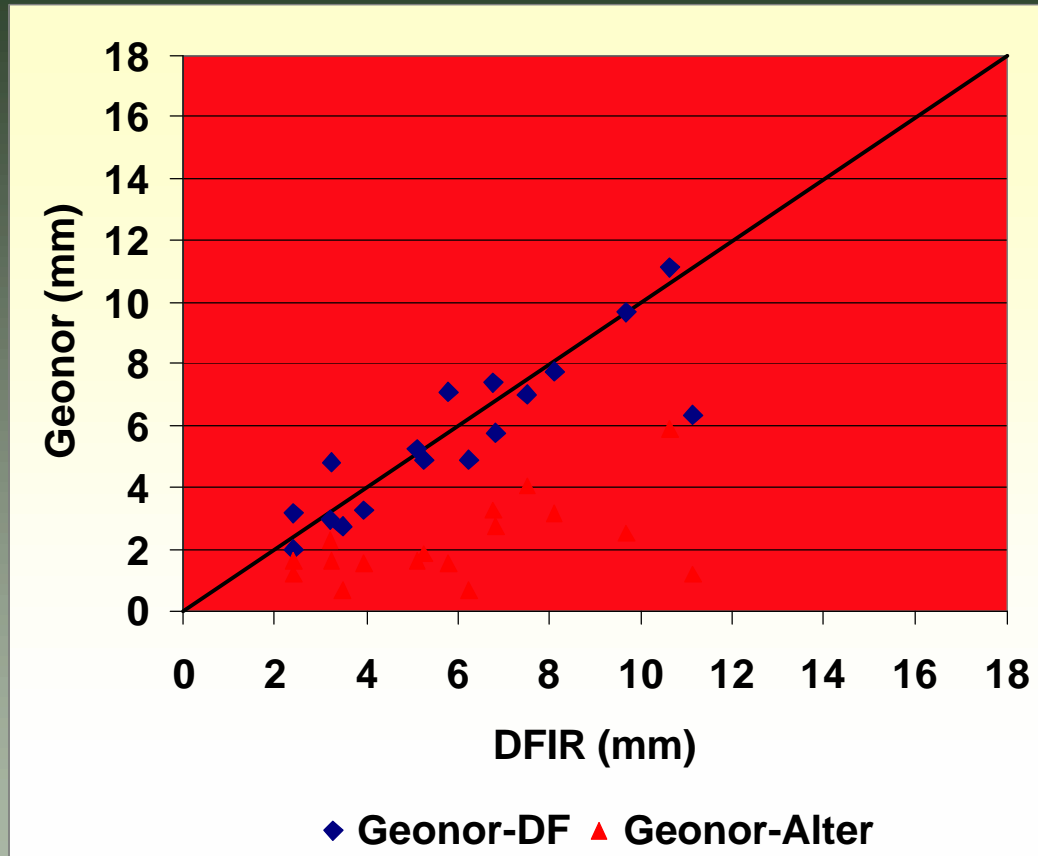
Dec-2003 through March-2005

Rain



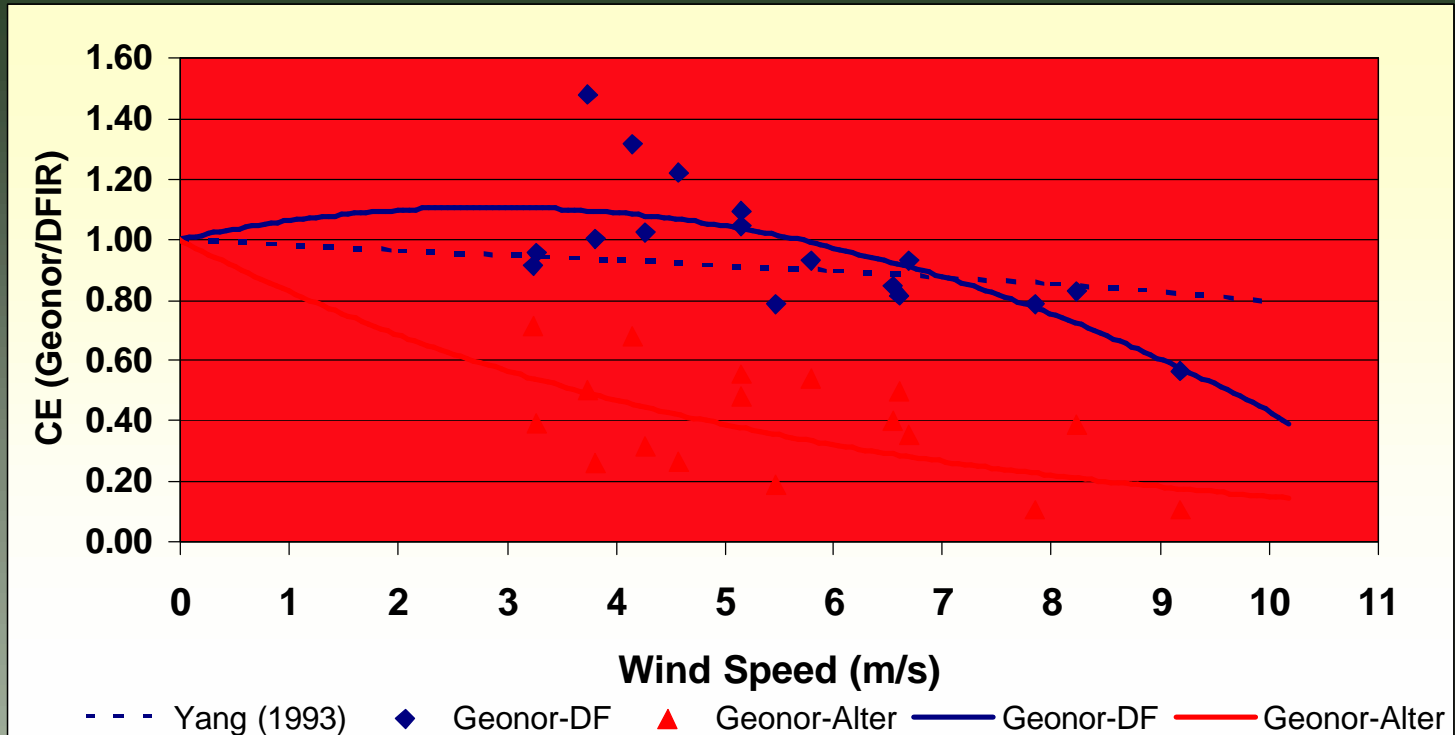
- both shields measuring similar precipitation
- ~ 16% undercatch as compared to DFIR
- $r^2=0.99$

Snow



- Geonor-DF catching much more snow than the Geonor-Alter
- Wind a large factor for Geonor-Alter catch

Wind Error for Snow



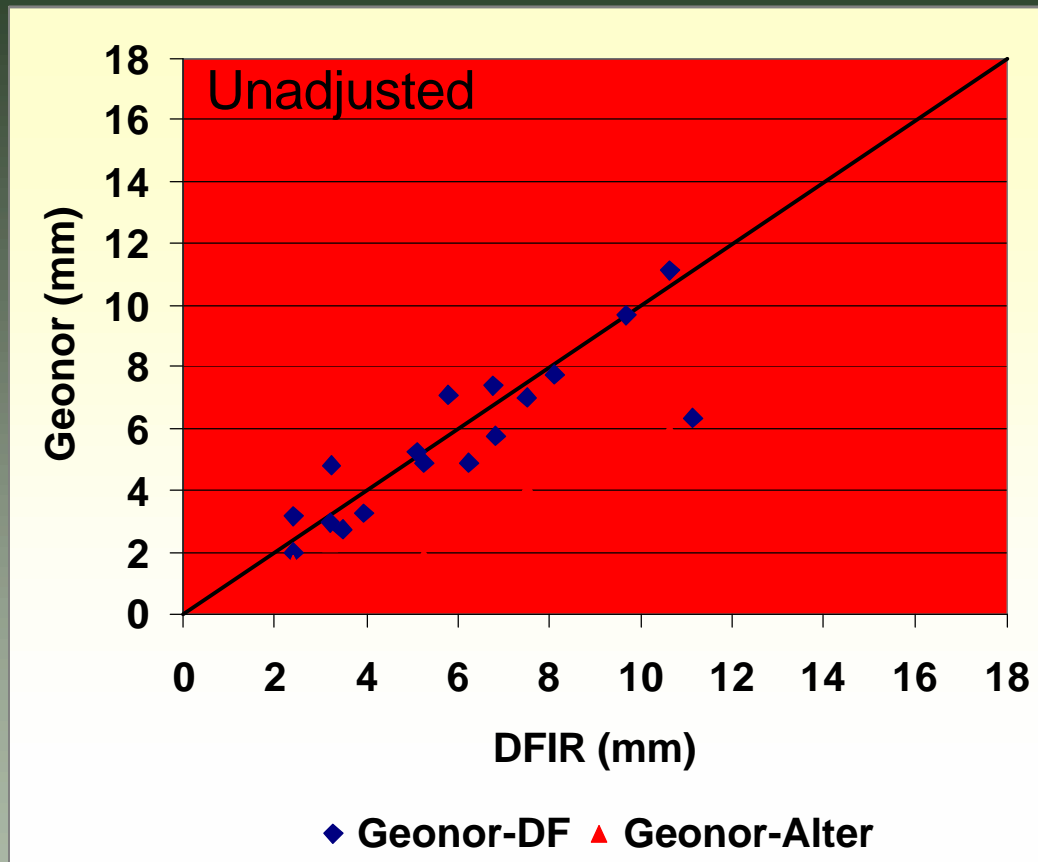
Geonor-DF:

$$CE = -0.013W_s^2 + 0.075W_s + 1, r^2 = 0.50$$

Geonor-Alter:

$$CE = e^{-0.190W_s}, r^2 = 0.31$$

Adjusted Snow



Geonor-DF

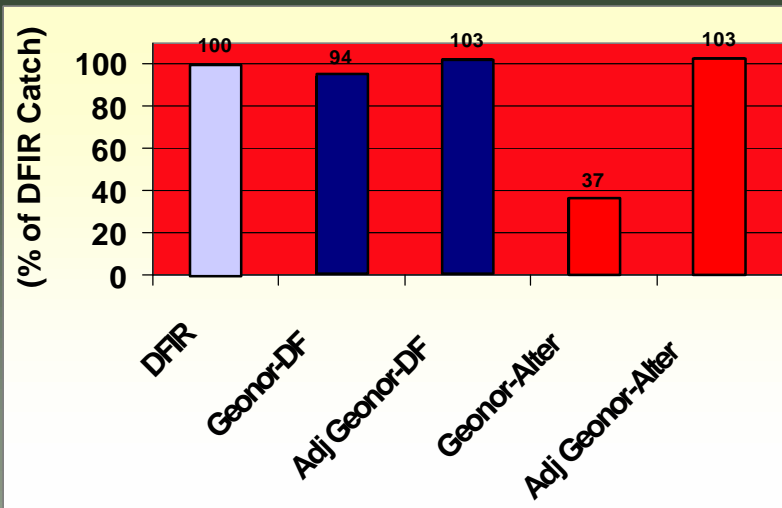
- only adjust if wind > 6 m/s
- $r^2 = 0.94$, very little scatter

Geonor-Alter

- $r^2 = 0.33$, lots of scatter
- messy but adjusted still better than unadjusted

Summary

Cumulative CE for Snow



- Wind adjustments for snow much larger than for rain
- Wind adjustments for Geonor-DF are relatively small (0% at 6 m/s)
- Wind adjustments for Geonor-Alter are large (300% at 6 m/s)

- **To refine adjustments**
 - more data, especially at wind speeds < 3 m/s
 - more accurate precipitation timing and typing (Precipitation Occurrence Sensing System)

Implications for drought monitoring....





Thank-You

Questions??



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