



University of New Brunswick – Nav Canada

Atmospheric Investigations for WAAS

Troposphere

Paul Collins and Richard Langley

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Geodetic Research Laboratory, Department of Geodesy and Geomatics Engineering, University of New Brunswick.



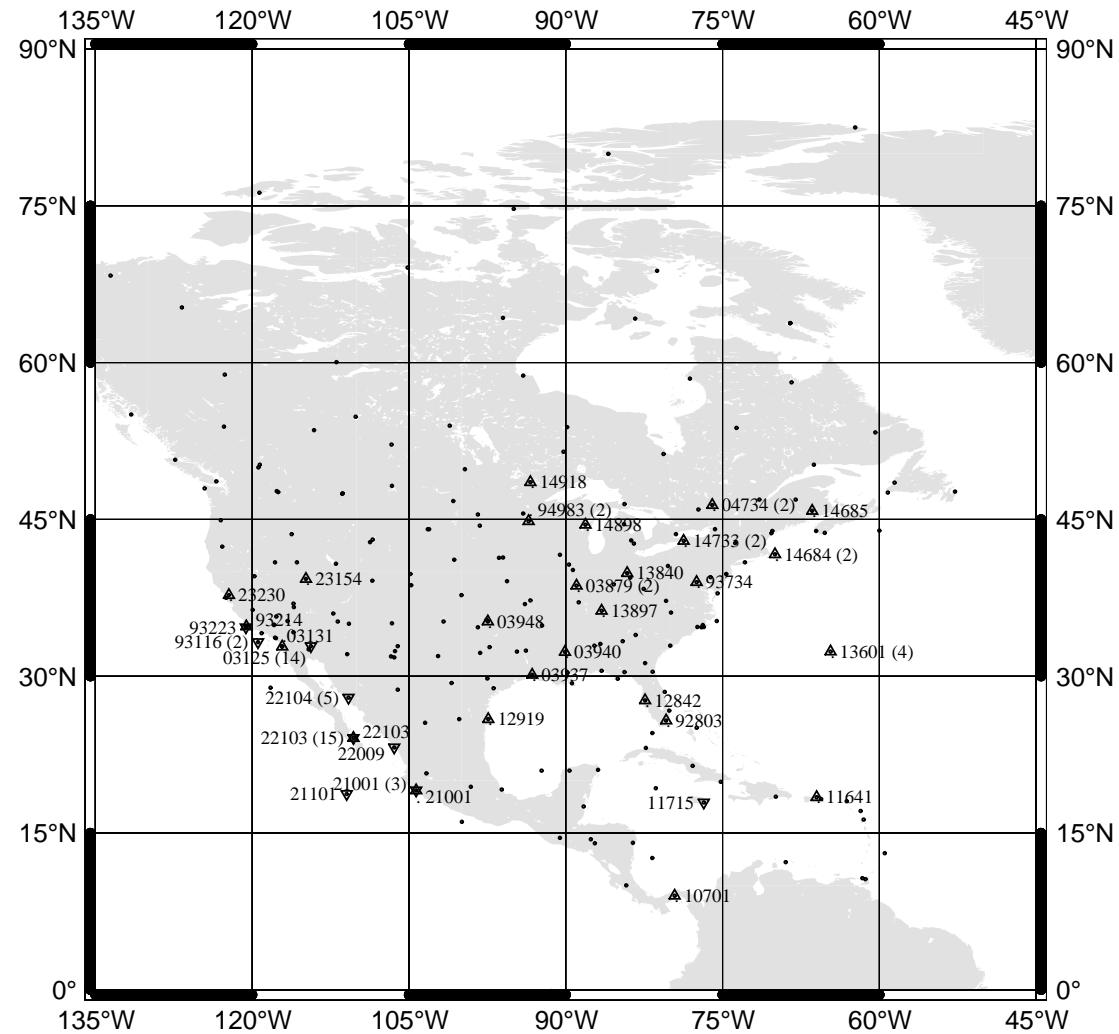
Latest Developments



- Processed 10 years of North American radiosonde data, from 1987–1996.
- Approximately 100,000 profiles per year, ~1,000,000 in total.
- UNB3 model values at the zenith are subtracted from the zenith ray-trace values to give the residual tropospheric delay (UNB3 model error).
- Use ± 0.20 m as “non-extreme” cut-off range for UNB3 zenith model error.
- 77 residuals (extremes) outside this range ~0.008% (99.99239% within this range).

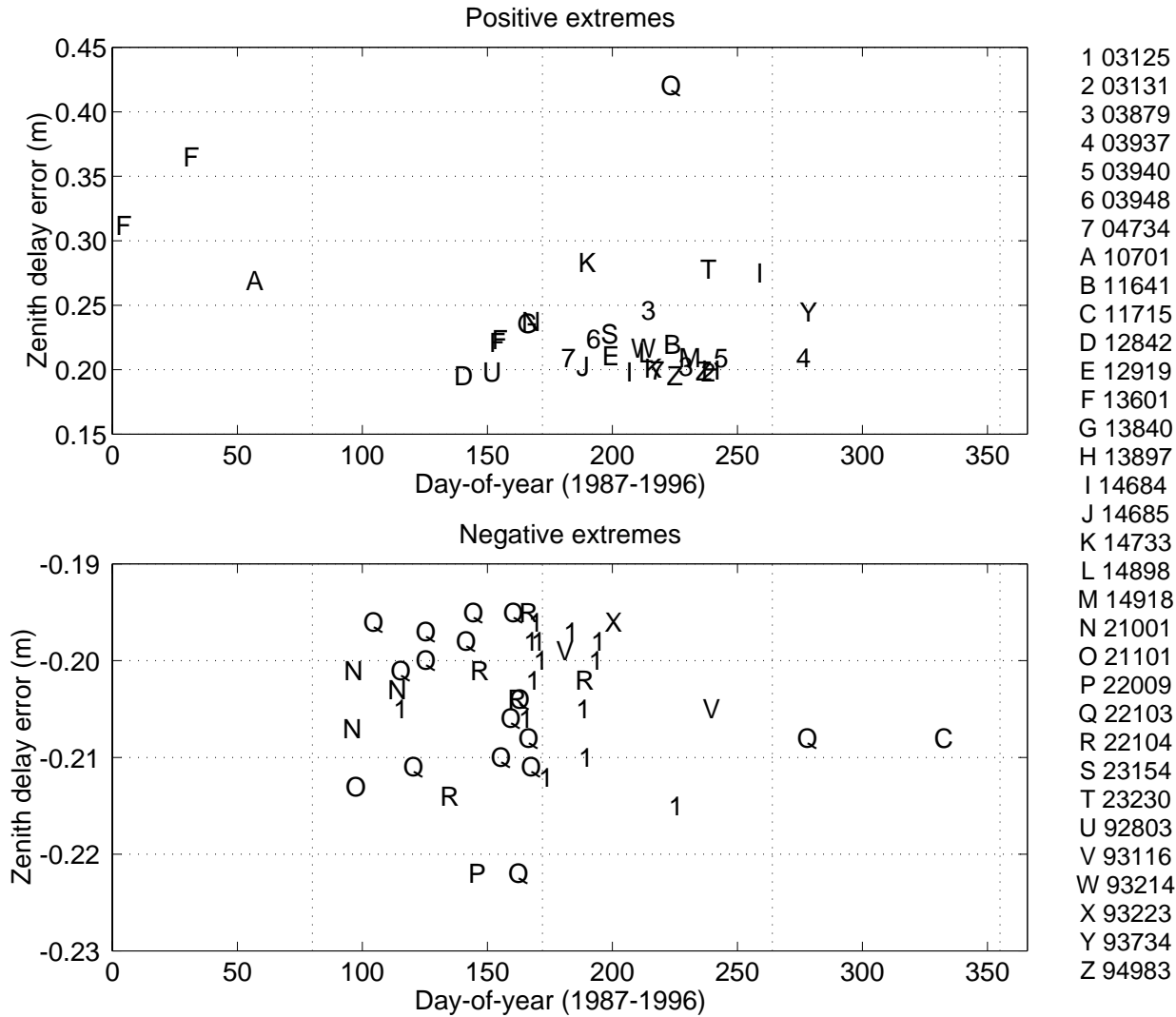


Station Locations





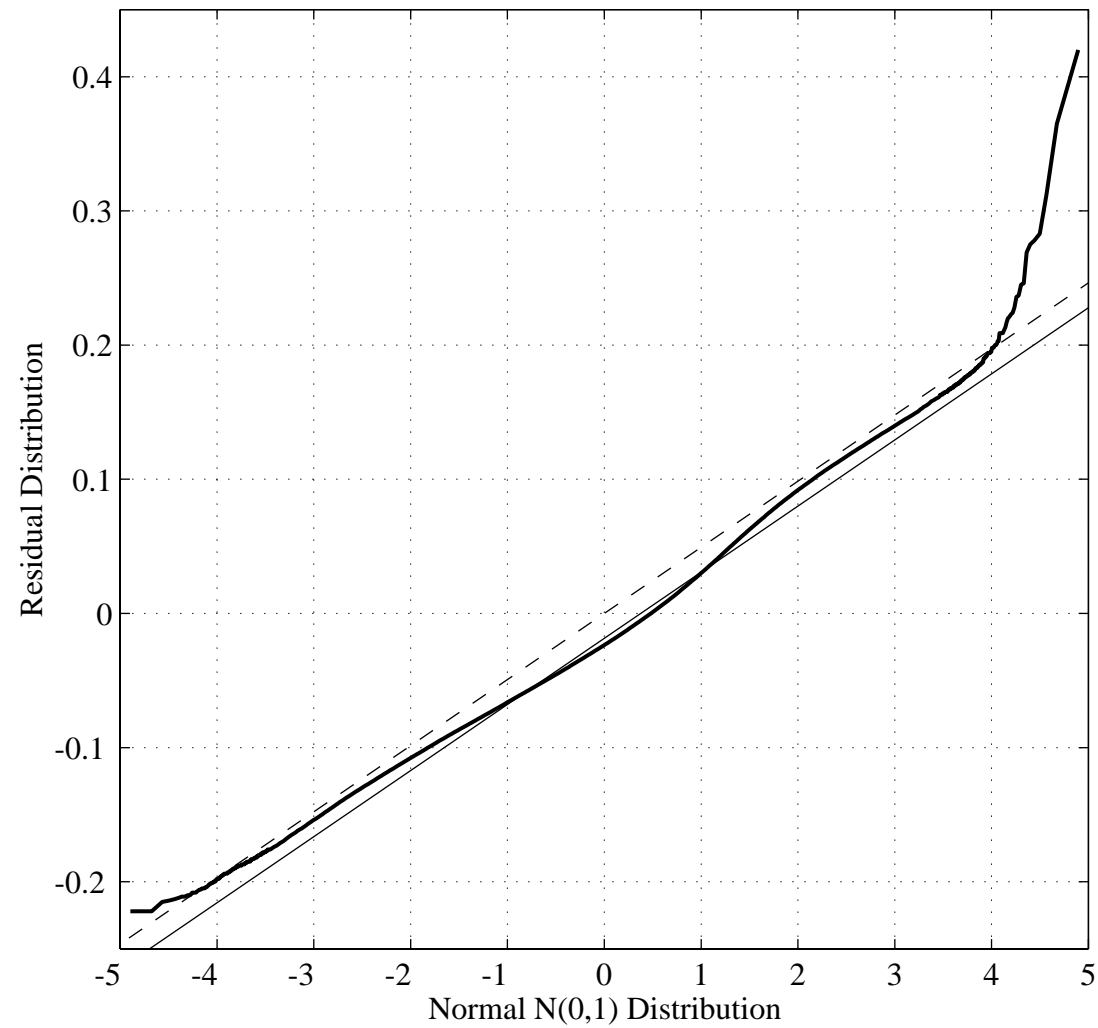
Seasonal Trend of Extremes



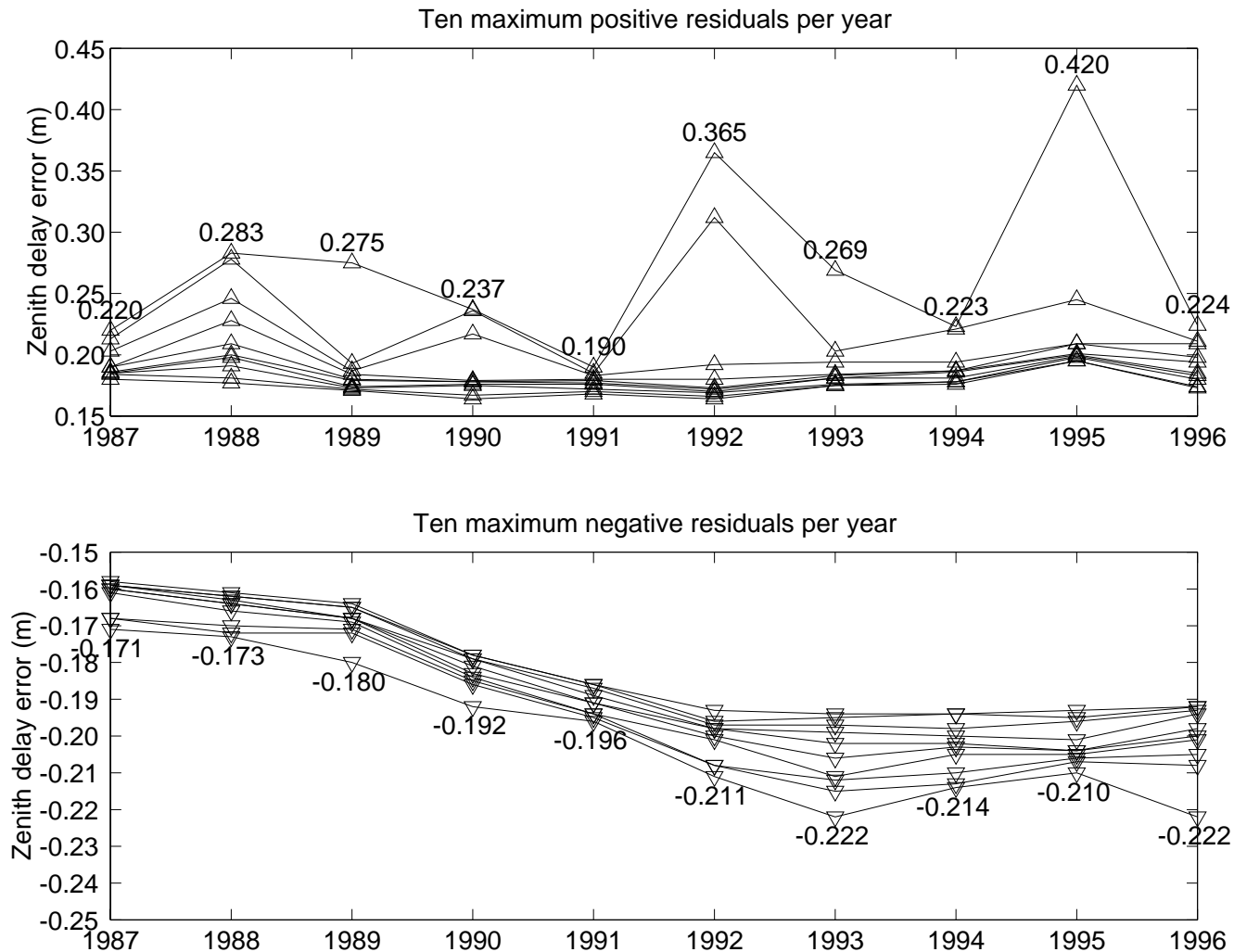


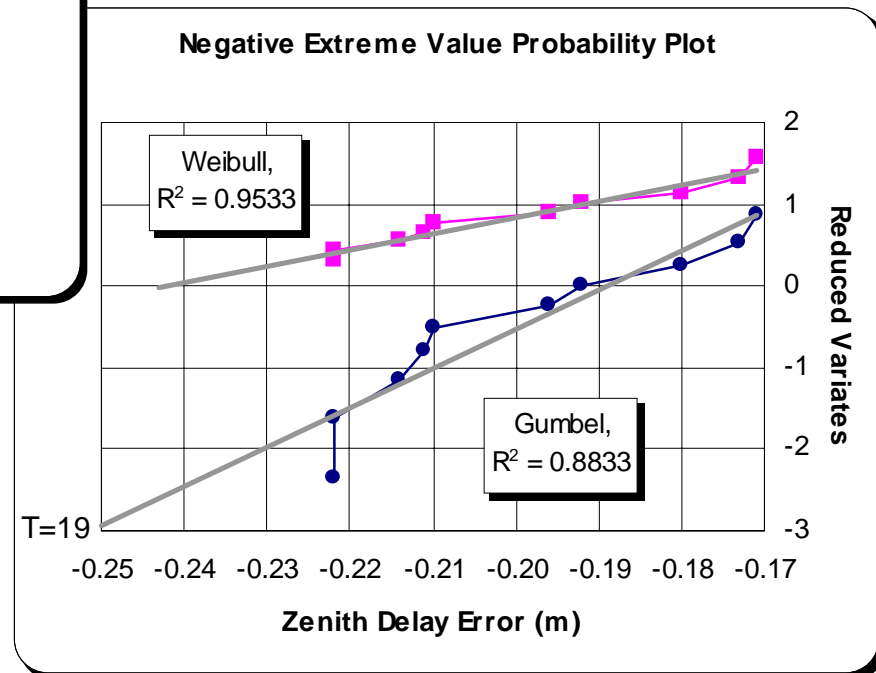
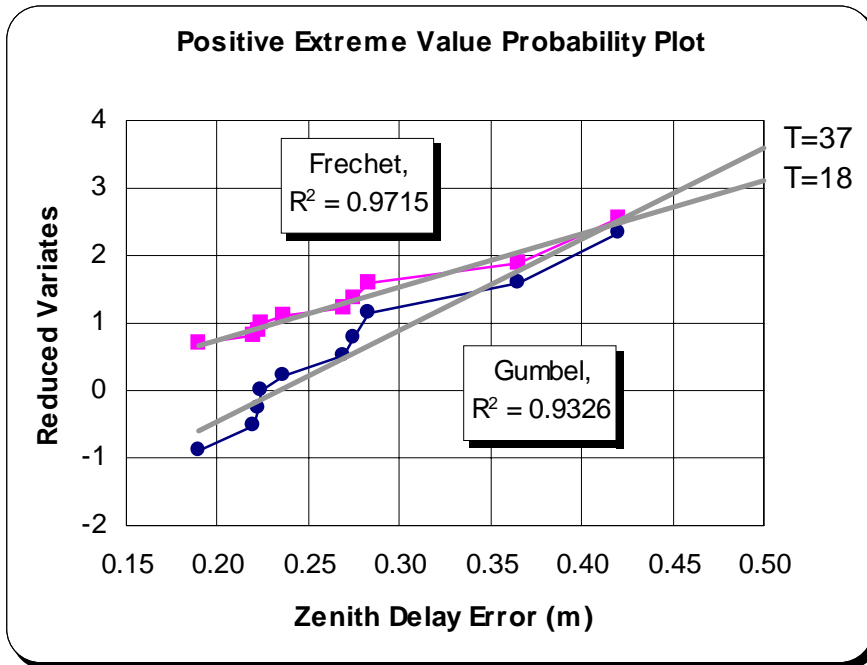
Residual Distribution

Gaussian Plot of Zenith Delay Residuals



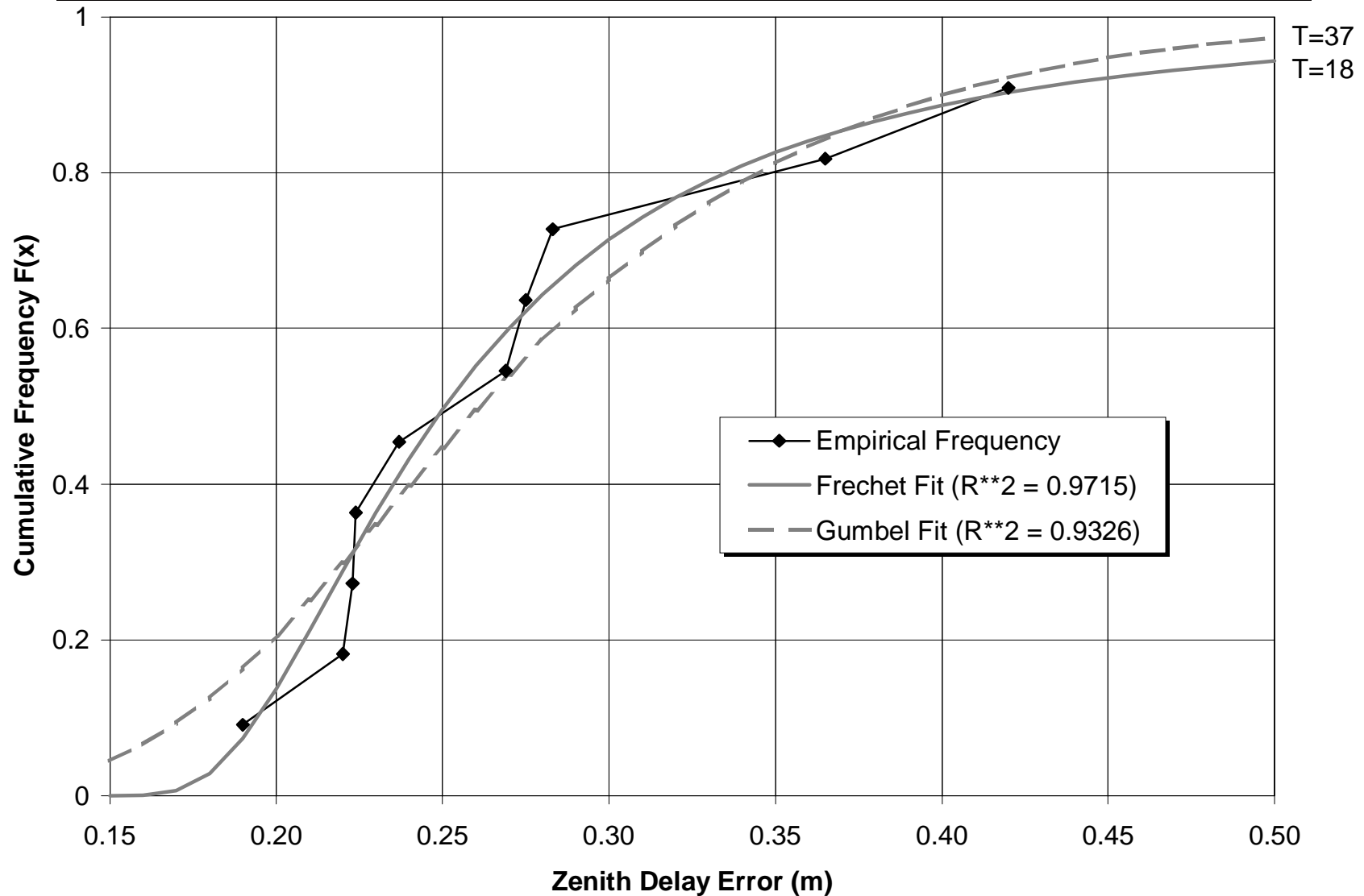
Positive and Negative Order Statistics





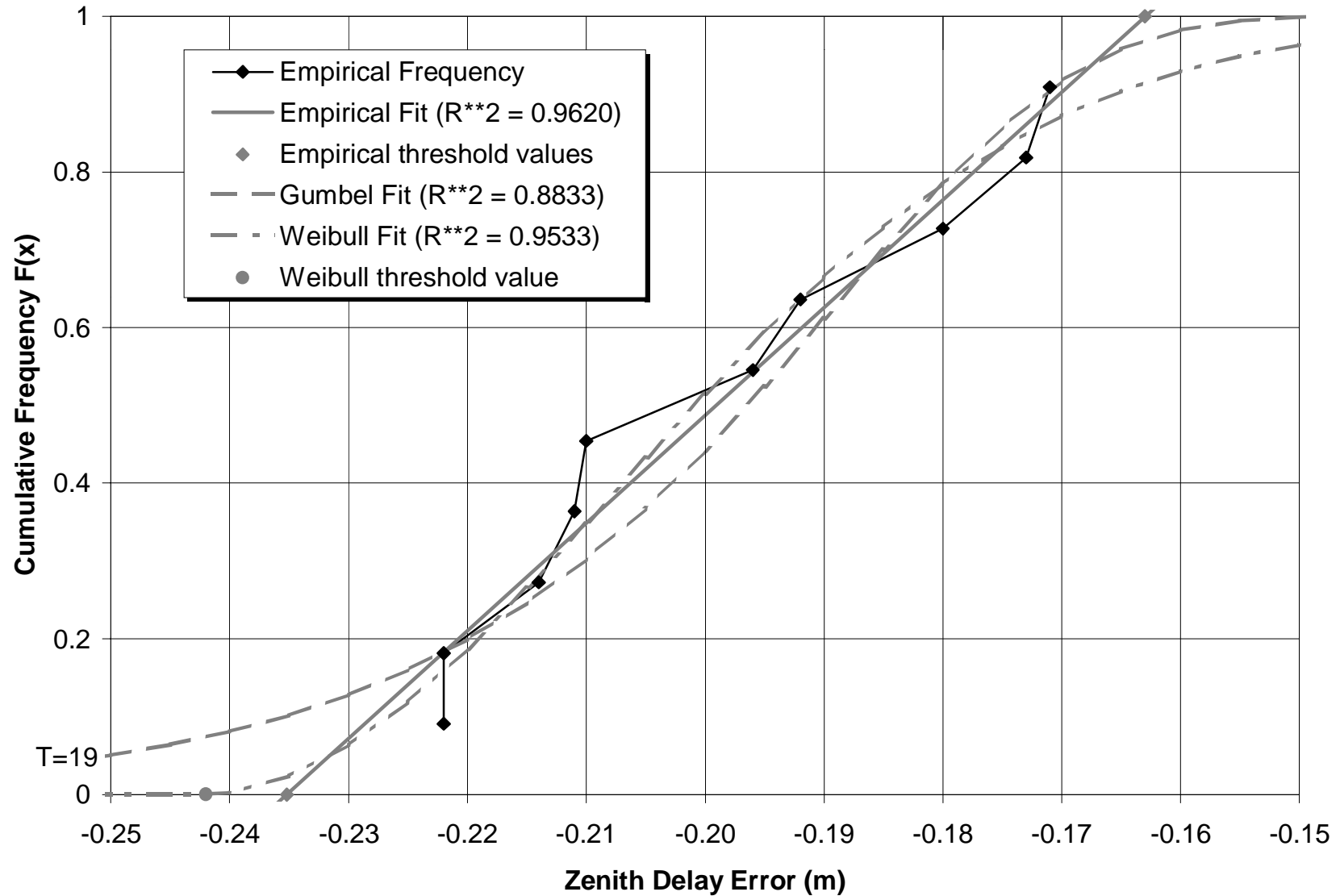


Positive Extreme Cumulative Probability Plot





Negative Extreme Cumulative Probability Plot





Summary and Conclusions



- UNB3 model model performs very well:
mean = -0.02 m, standard deviation = 0.05 m.
- Can be reasonably represented by zero-mean Normal distribution upto $\pm 4\sigma$ ($\sim \pm 0.20$ m).
- Beyond -4σ , Normal distribution is conservative (residuals appear to level off).
- Beyond $+4\sigma$, Normal distribution is unreliable (residuals diverge significantly).
- More processing (i.e. at least another 10 years data) required to improve confidence in statistical forecasts.