An Updated Evaluation of the Skill of the Storm Prediction Center's Probabilistic Convective Outlooks

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Data

- Time period: 2005–21
  - SPC probabilistic convective outlooks
  - Observed storm reports (OSRs)
  - Tornadoes, hail, damaging wind
- Put on 80-km by 80-km grid

Methods

- Relative skill = $^{(CSI_{outlook}-CSI_{min})}/_{(CSI_{max}-CSI_{min})}$
  - CSI = $^{hits}/_{hits+misses+false\ alarms}$
  - Max/min CSI based on smoothed OSR field verified using OSRs

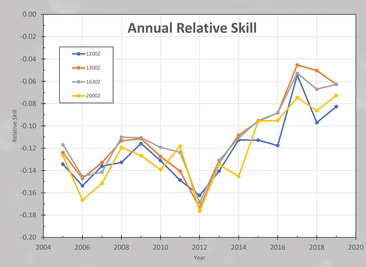
Methods (cont)

- Fractions Skill Score = $1-\frac{\sum_{i=1}^{N}\left(P_{F(i)}-S_{O(i)}\right)^2}{\sum_{i=1}^{N}\left(P_{F(i)}^2-S_{O(i)}^2\right)}$
  - $P_{F(i)}$ is fcst prob at i^{th} point
  - $S_{O(i)}$ is smoothed obs field at i^{th} point
- Brier Skill Score = $1-\frac{BS}{BS_{ref}}$
  - $BS=\frac{1}{N}\sum_{i=1}^{N}\left(P_{F(i)}-S_{O(i)}\right)^2$
    - $P_{F(i)}$ and $S_{O(i)}$ are same as for FSS above
    - BS_{ref} is Brier Score based on reference field instead of a forecast
      - Here, climatological frequency of each hazard at each grid point used

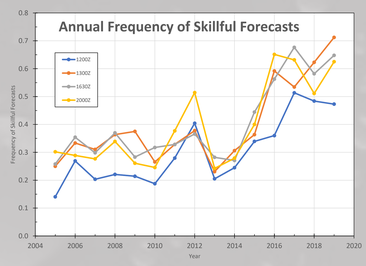
Concluding Thoughts

- Annual relative skill values increased for all hazards after 2012
- Forecasts were more frequently skillful (relative skill) by end of study period
- No major trends observed for any hazard using Fractions Skill Score
- Improvement, especially for wind, in Brier Skill Score
- Tornado forecasts show more room for improvement over hail and wind

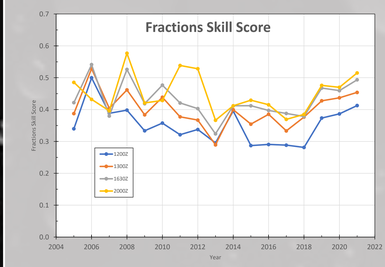
Tornadoes



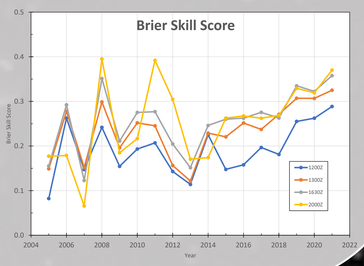
- Not skillful annually
- Improved since 2012 consistently



- Increased frequency beginning in 2013
- Updates skillful over 50% starting 2016

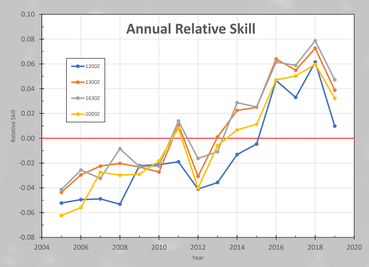


- No major trends
- Improvements noted beginning in 2019

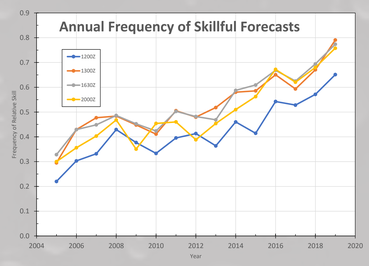


- High variability early in the period
- Increasing scores starting in 2015

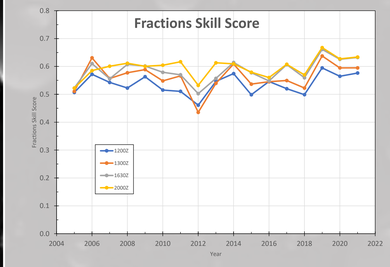
Hail



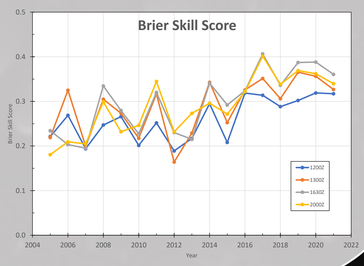
- Increasing trend after 2012
- Updates skillful beginning in 2014



- Consistent increase in frequency
- Updates skillful over 50% starting 2014

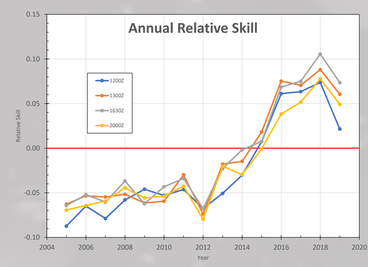


- No trends in values across updates
- Small uptick beginning in 2019

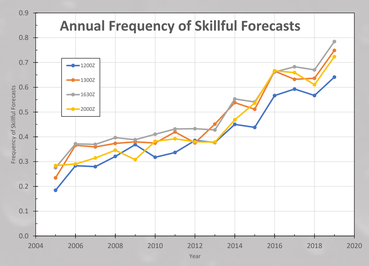


- High variability, no trends until 2015
- Higher values starting in 2016

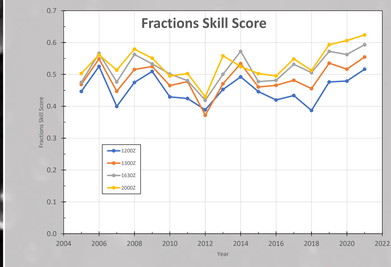
Damaging Wind



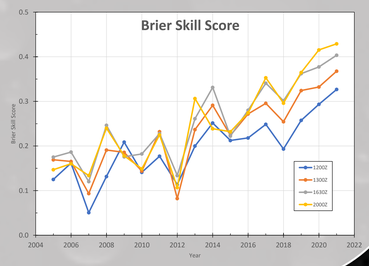
- Increase in skill after 2012
- Consistently skillful beginning in 2015



- Consistent increase in frequency
- Updates skillful over 50% starting 2015



- No major trends through study period
- Small increase in values starting 2019



- General improving trend throughout
- Larger increase begins after 2018