

Sky Brightness at the Candidate Observatory Sites

Wayne Baggett

HAL General Meeting

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Astronomical Needs

- Dark Skies
- Good Seeing
- High Transparency
- Many Clear Nights

Dark Skies turned out to be the only one of these we could reasonably use for evaluation purposes.

Local Light Pollution Map

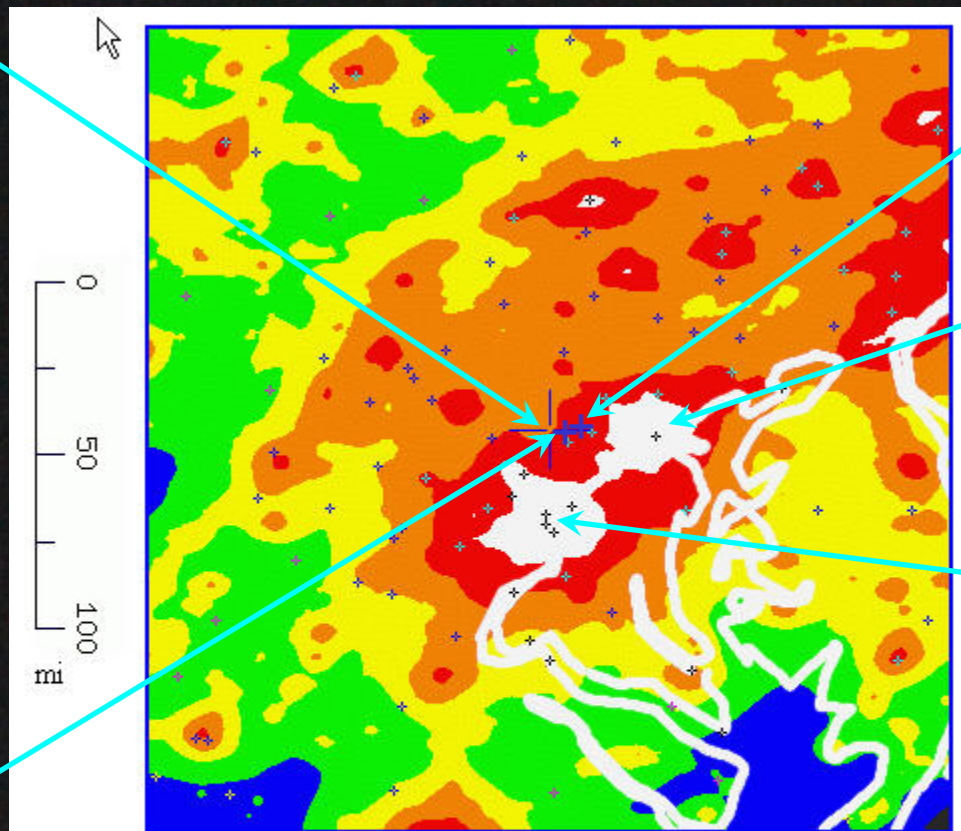
Carrs Mill

Alpha Ridge

Baltimore

Washington, DC

West
Friendship



Map from
<http://cleardarksky.com/lp/CarrsMDlp.html?Mn=meteorites>

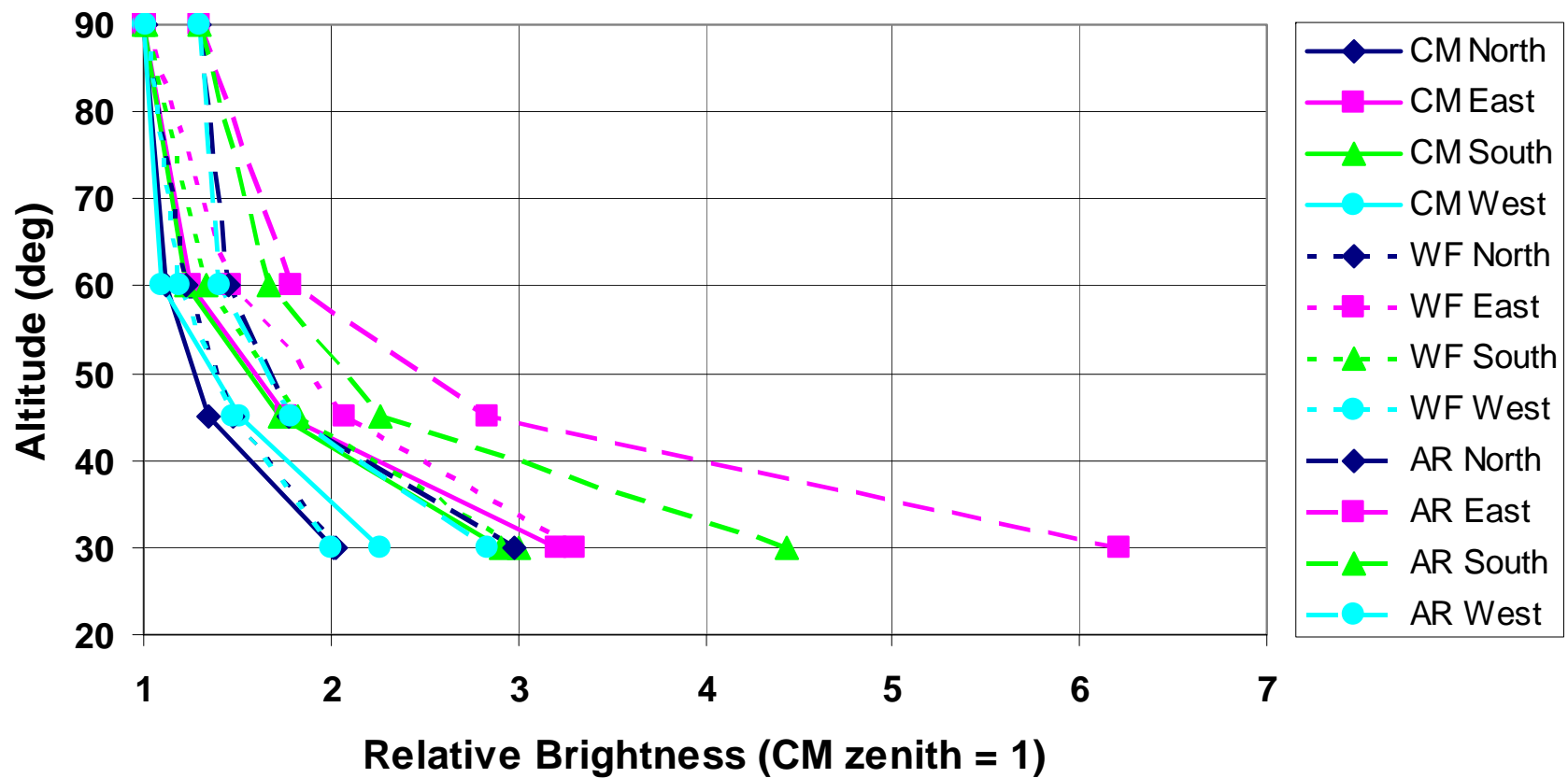
Credit: P. Cinzano, F. Falchi (University of Padova), C. D. Elvidge (NOAA National Geophysical Data Center, Boulder). Copyright Royal Astronomical Society. Reproduced from the Monthly Notices of the RAS by permission of Blackwell Science.

Sky Brightness Observations

- Two sites each on two different nights
 - 14 Oct 2006: Carrs Mill and West Friendship
 - 21 Oct 2006: Alpha Ridge and ~~West Friendship~~
- Data Characteristics
 - Canon Digital Rebel, ISO 400, 30 sec, RAW format
 - 18mm FL, F/3.5
 - Fixed tripod
 - 90, 60, 45, and 30 degrees altitude, NSEW
 - Fully calibrated for photometry

Sky Brightness Results

Carrs Mill, West Friendship, Alpha Ridge Sky Brightness



Impact on Observing

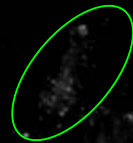
- Observations at AR compared to CM or WF
 - Naked Eye – Loss of ~ 0.3 in zenith limiting magnitude, worse E and S
 - Moon, bright planets – No impact
 - Stars, double stars – No real impact
 - Open clusters – Loss of faintest stars
 - Globular clusters – Loss of fainter stars
 - Nebulae and Comets – Extent will be reduced as low surface brightness areas lost
 - Galaxies -- Extent will be reduced as low surface brightness areas lost

Pristine Sky (22.0 mag/sq. arcsec)



Assume can see surface brightness 2.5 mag/sq. arcsec fainter than sky; i.e., galaxy cut off at 24.5 mag/sq. arcsec

CM Zenith (19.73 mag/sq. arcsec)



Assume can see surface brightness 2.5 mag/sq. arcsec fainter than sky; i.e., galaxy cut off at 22.23 mag/sq. arcsec

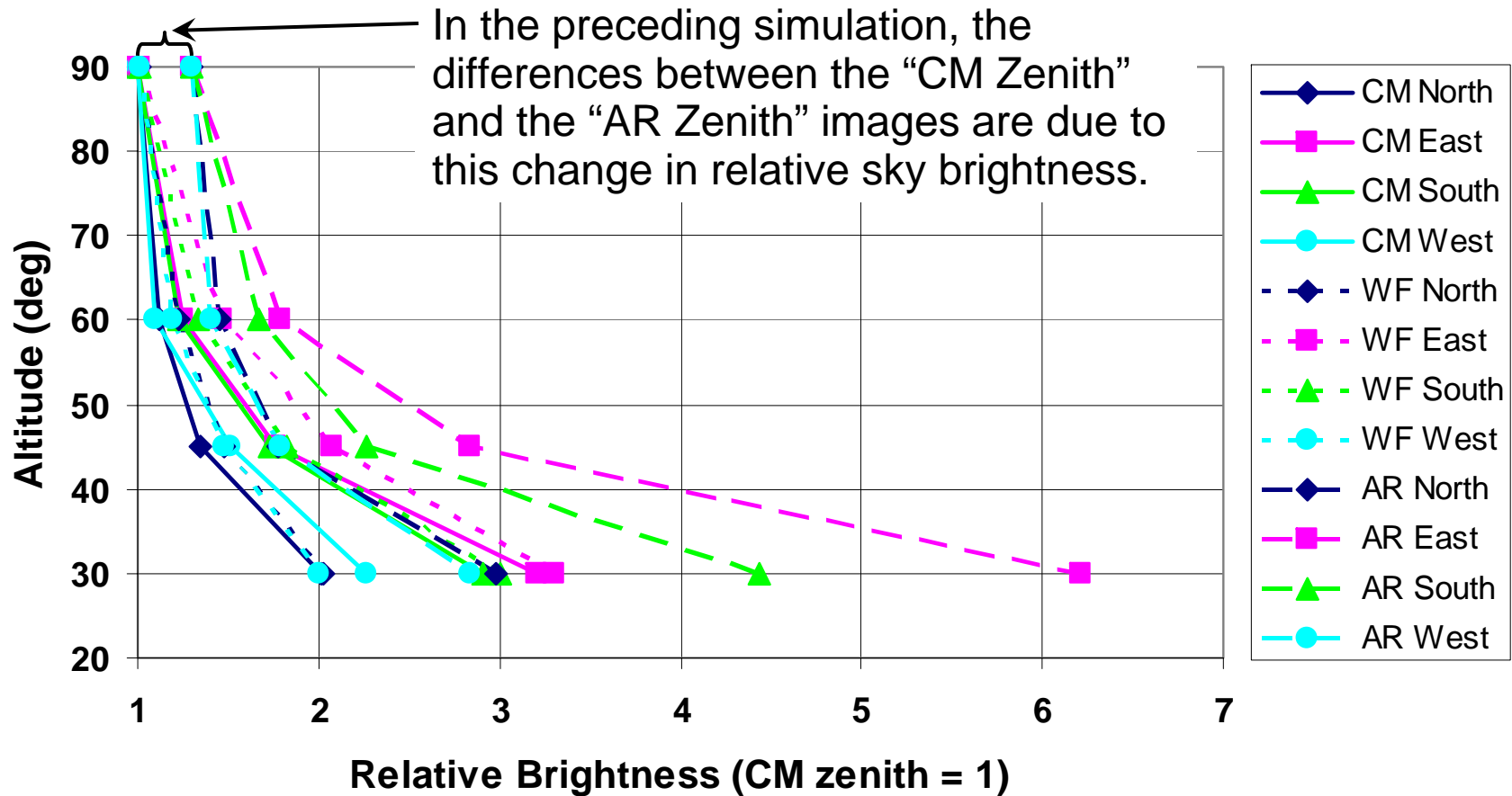
AR Zenith ($19.44 \text{ mag/sq. arcsec}$)



Assume can see surface brightness $2.5 \text{ mag/sq. arcsec}$ fainter than sky; i.e., galaxy cut off at $21.94 \text{ mag/sq. arcsec}$

Sky Brightness Results

Carrs Mill, West Friendship, Alpha Ridge Sky Brightness



Sky Brightness Summary

- Sky brightness was the only astronomical parameter investigated thoroughly
- No available site is truly dark
- Carrs Mill and West Friendship are darker than Alpha Ridge
- No significant impact on observing solar system and stellar objects
- Carrs Mill and West Friendship are somewhat better than Alpha Ridge for observing comets, nebulae, and galaxies