Subject: Lowest possible orbits for ATA tracking of satellites.
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Date: 3/7/2021, 00:37
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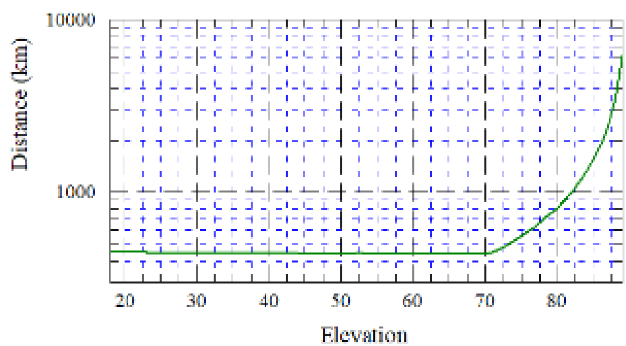
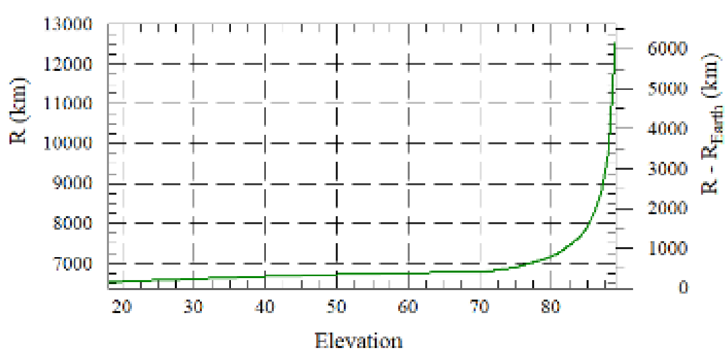
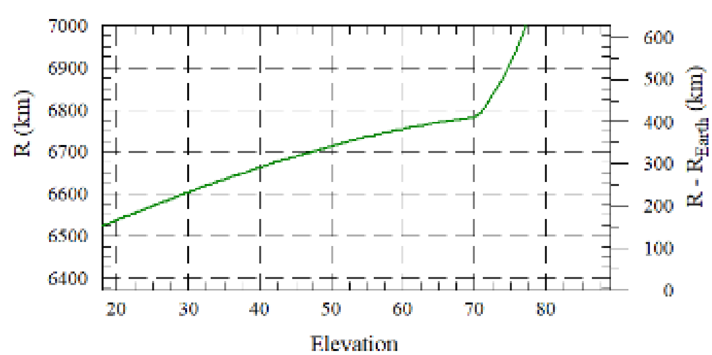
Thought this would be interesting since we've been talking about GPS tracking and what satellites the ATA can track across the sky...

Recently, I wrote a program for a GBT project that gives the minimum distances for a satellite before it's angular velocity exceeds the slew rate of the telescope. I resurrected it and gave it the ATA's values for maximum slew rates of 1d/sec in Elev and 3d/sec in Az. The algorithm could, but doesn't, take into consideration the height of the observatory above sea level, the oblateness of the Earth, and refraction.

D (top panel) is the distance between the telescope and the satellite, R (bottom two panels) is the distance from the center of the Earth (left axis) and distance above the ground (right axis). Bottom right panel is a blow-up of bottom left panel. Anything flying above the curves can be tracked by the ATA.




If your curious, below ~70d, the distance limit is set by the maximum elevation slew rate. Above 70d, the distance limit is set by the maximum azimuth slew rate (i.e., above ~70d, 3d/sec*cos(elev) becomes < 1d/sec ).

Deriving the algorithm was pretty fun and rewarding as it requires combining in a unique way concepts we all learned, most in High School. So, I won't deny others the pleasure of working it out for themselves. One clue: you have to use a tool that was first employed by the Babylonians.