

**McKay Brothers
Microwave**



**Quincy
Extreme Data**

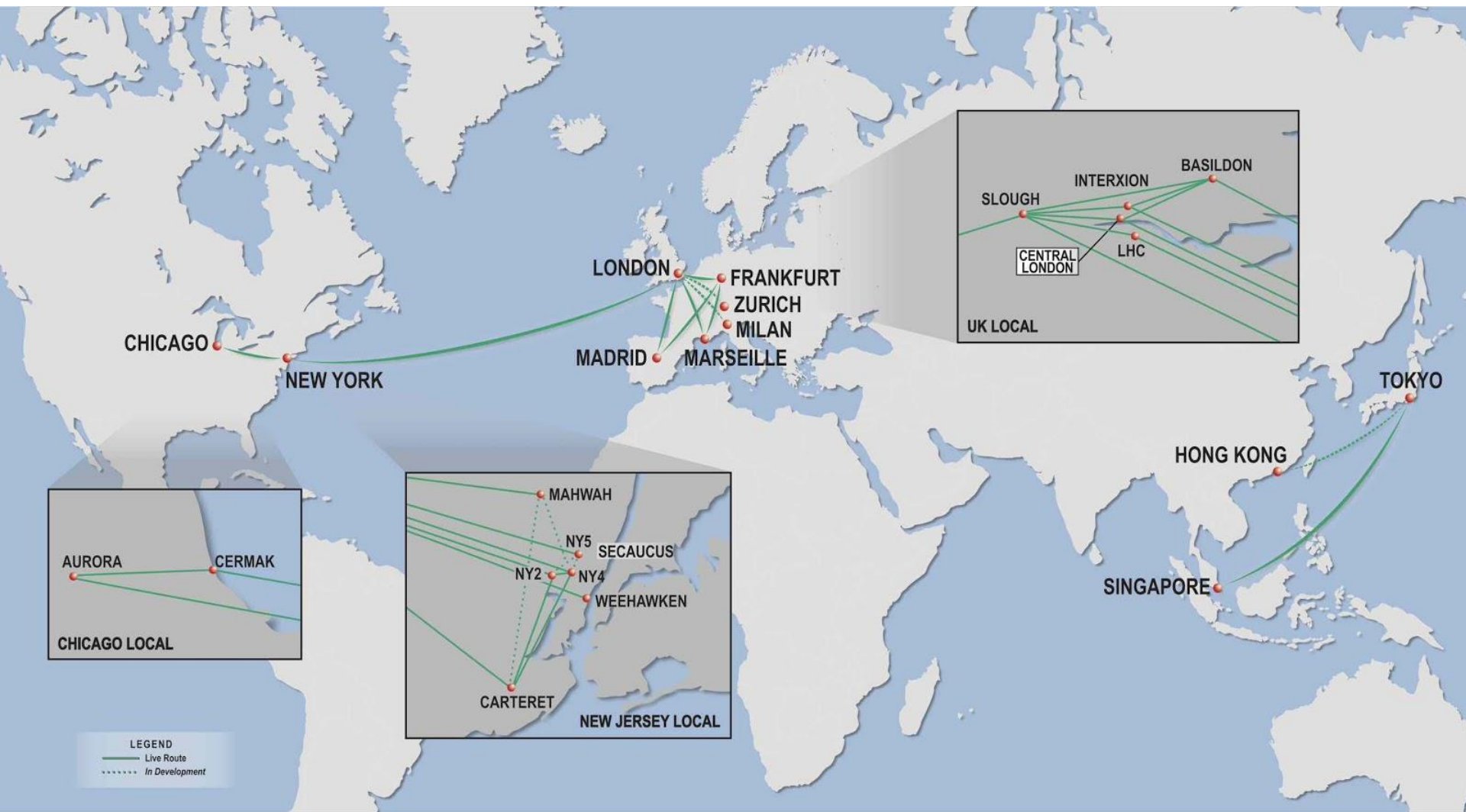
The race season 5 What's in the air?

May 2017

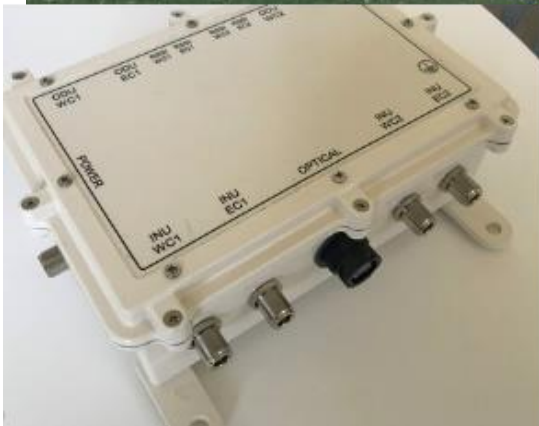
Stéphane Tyč

McKay & Quincy Footprint

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The Race to Lower Latency Never Ends



The Race to Lower Latency Never Ends

4



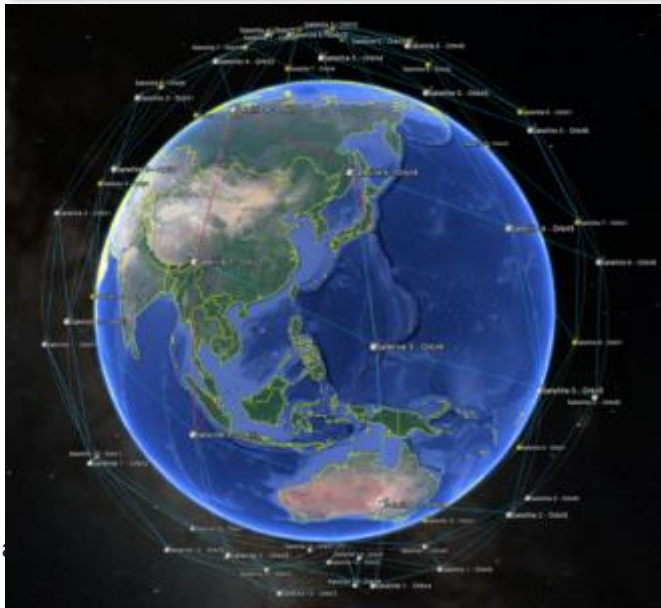
McKay's current path (below) is 1 mile off the geodesic.
McKay's new path in development (above) is 0.15 miles off the geodesic

McKay's first US
tower build in
Sandusky, OH

What's Next?

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Satellites?
Drones?
Balloons?



Important Variables to Explore

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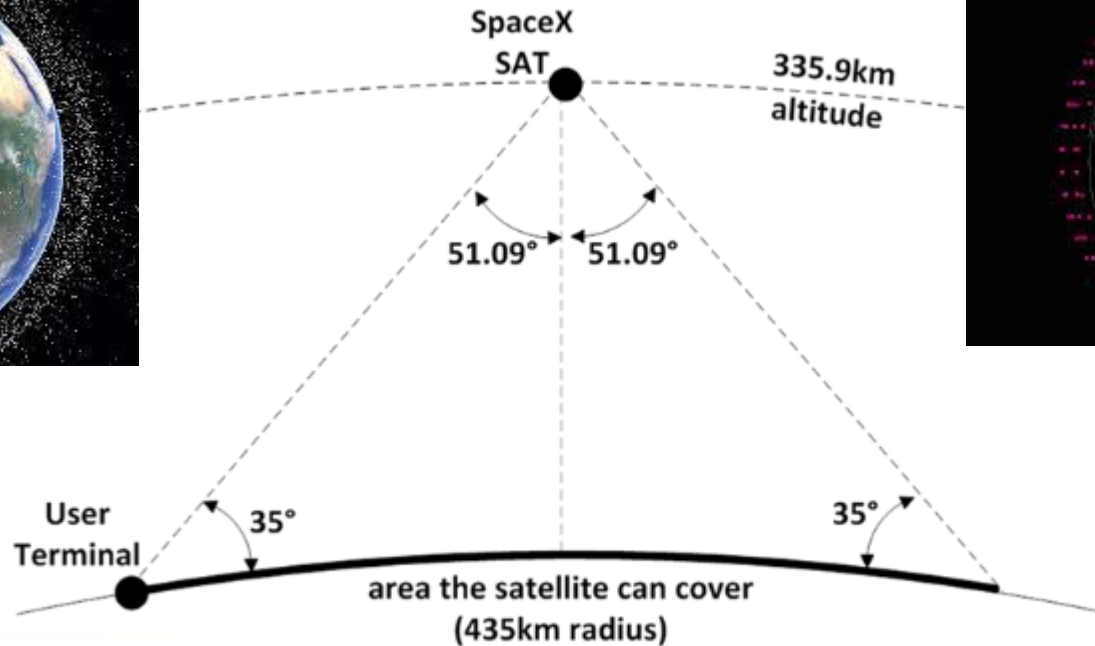
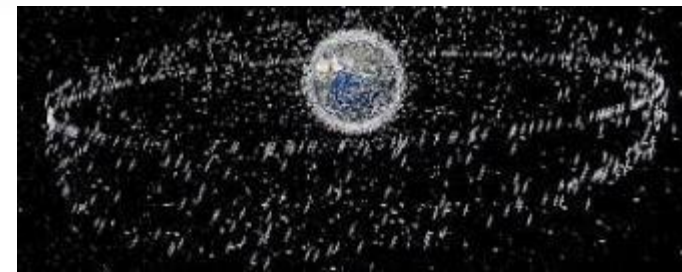
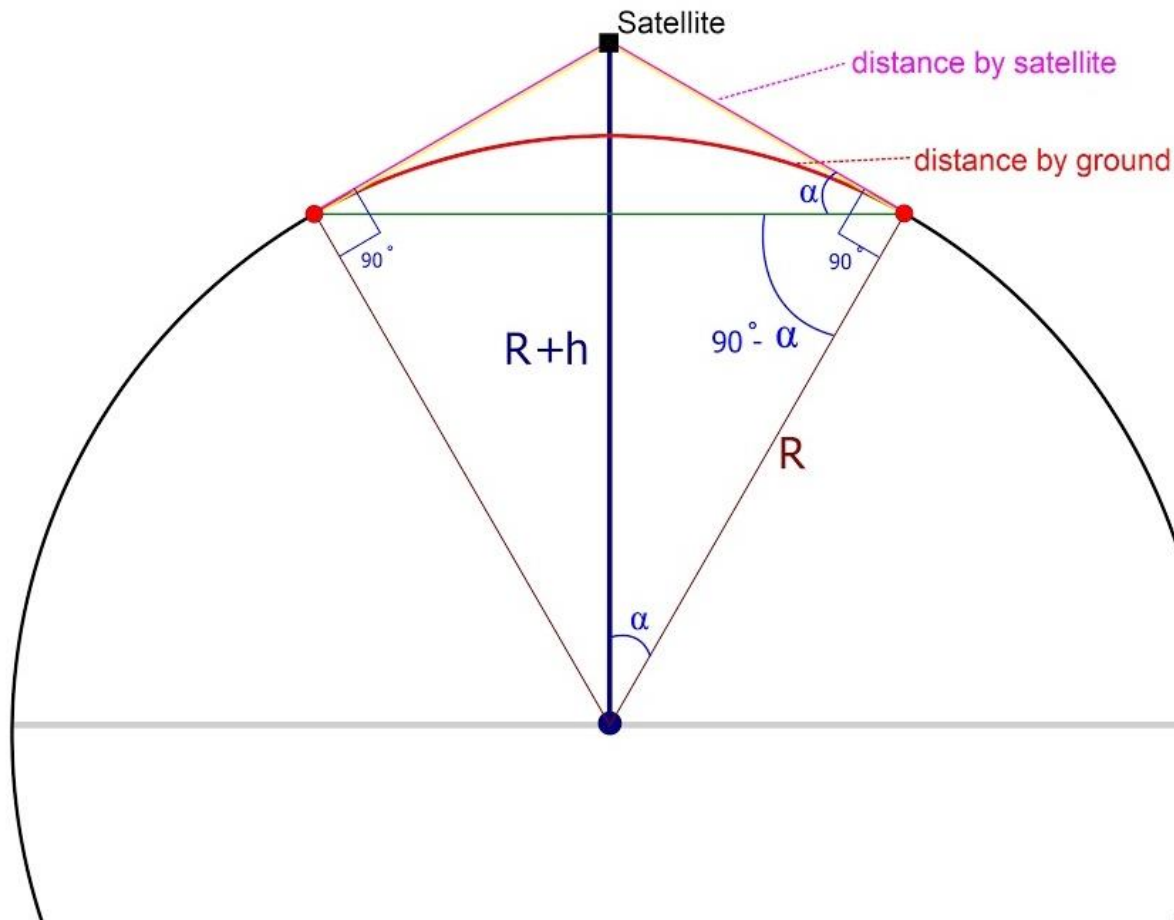


Figure 2: Steerable Service Range of VLEO Beams (335.9 km)



Important Variables to Explore

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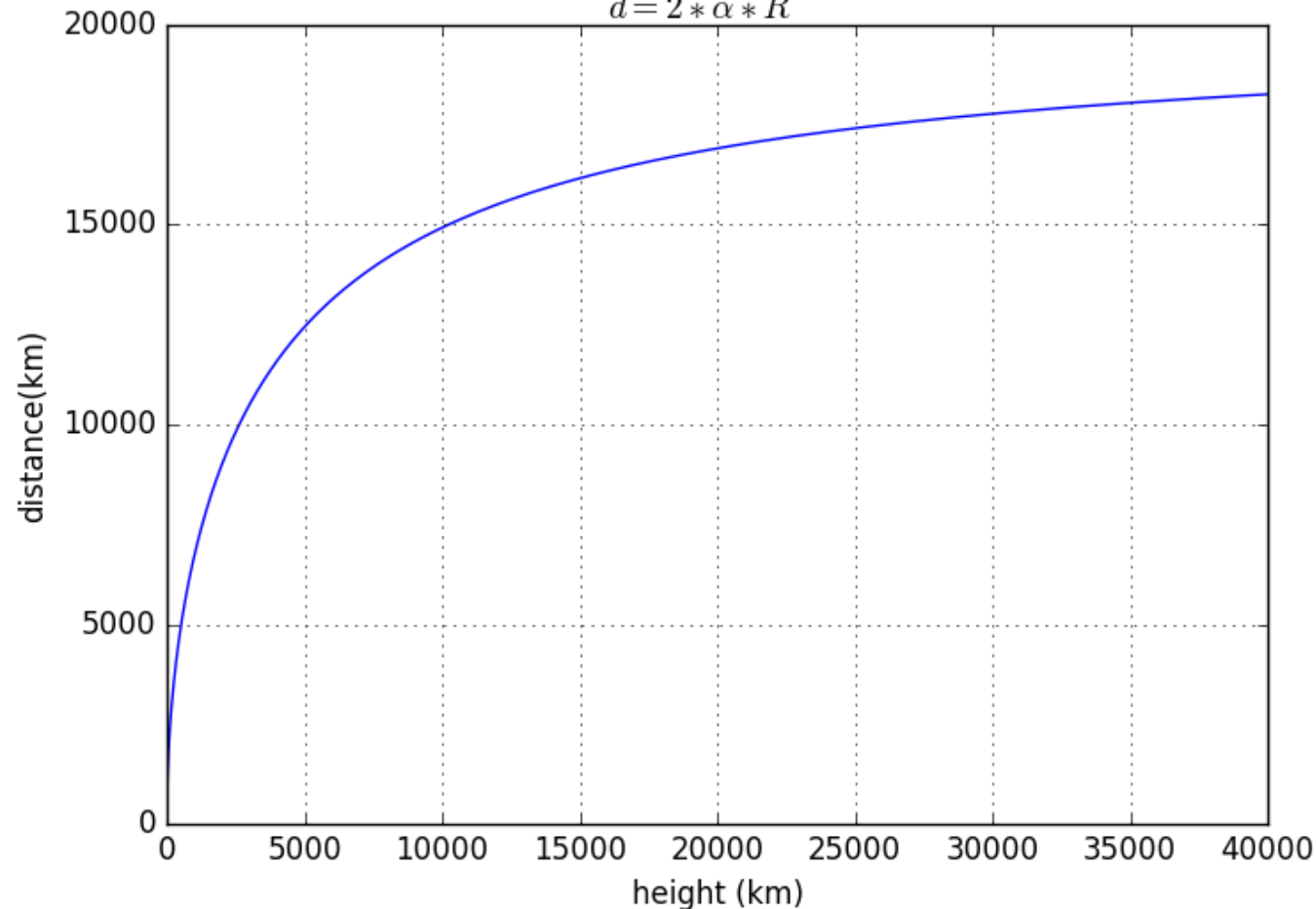
What altitude to chose?

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Coverage area diameter as function of diameter

$$height = R * \left(\frac{1}{\cos(\alpha)} - 1 \right)$$

$$d = 2 * \alpha * R$$



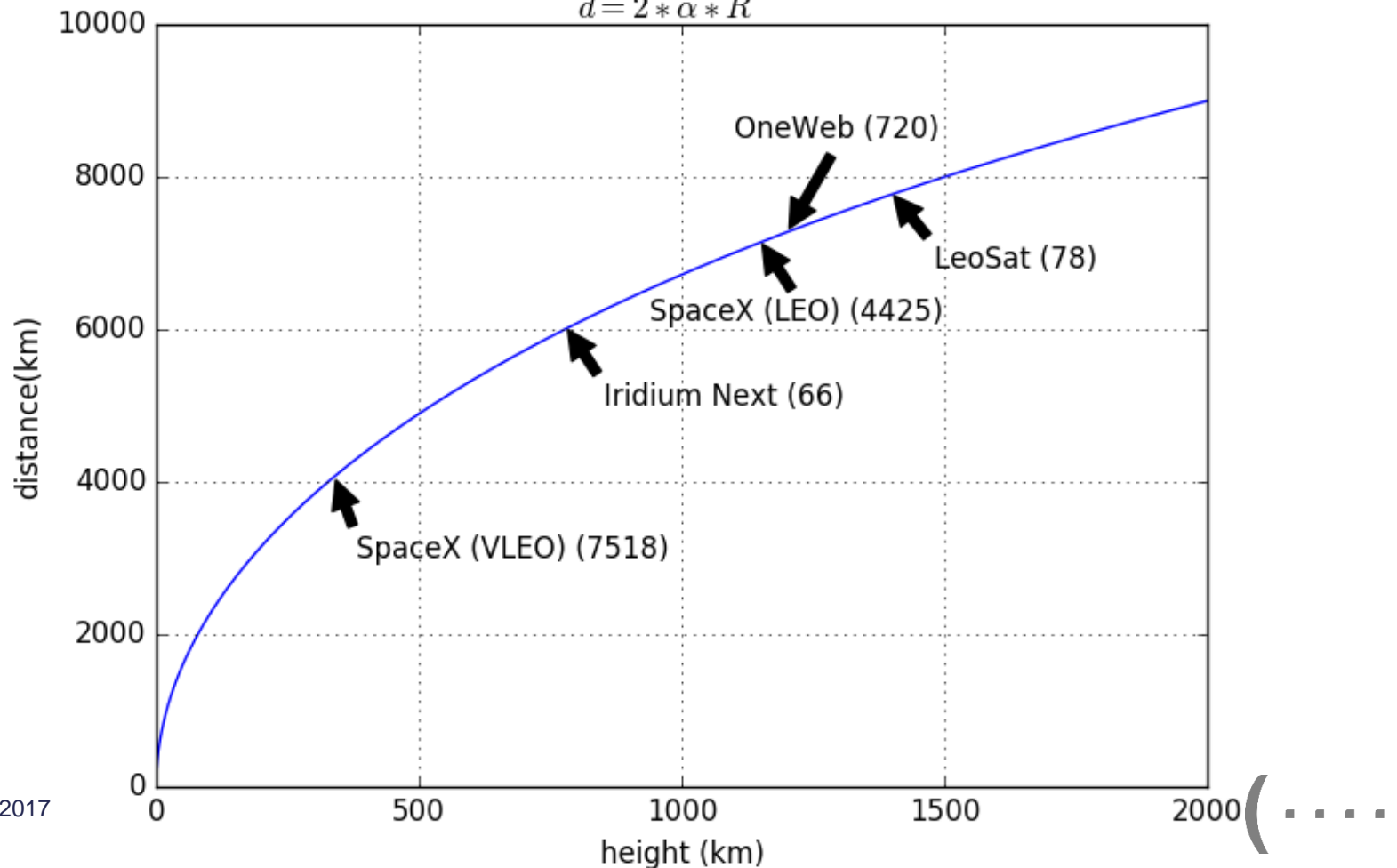
Constellations in the works

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Coverage area diameter as function of height

$$height = R * \left(\frac{1}{\cos(\alpha)} - 1 \right)$$

$$d = 2 * \alpha * R$$

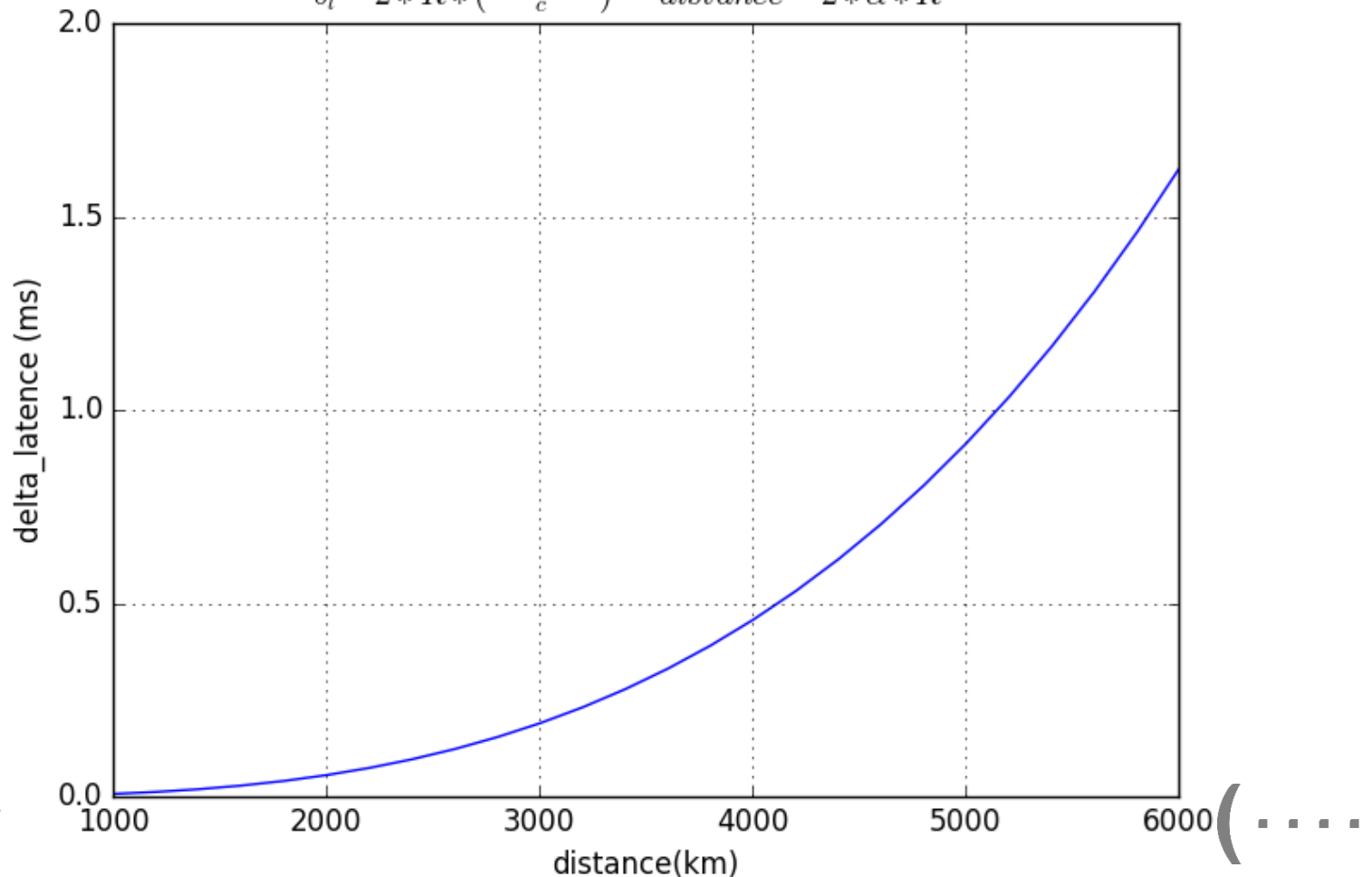


What is the extra path length?

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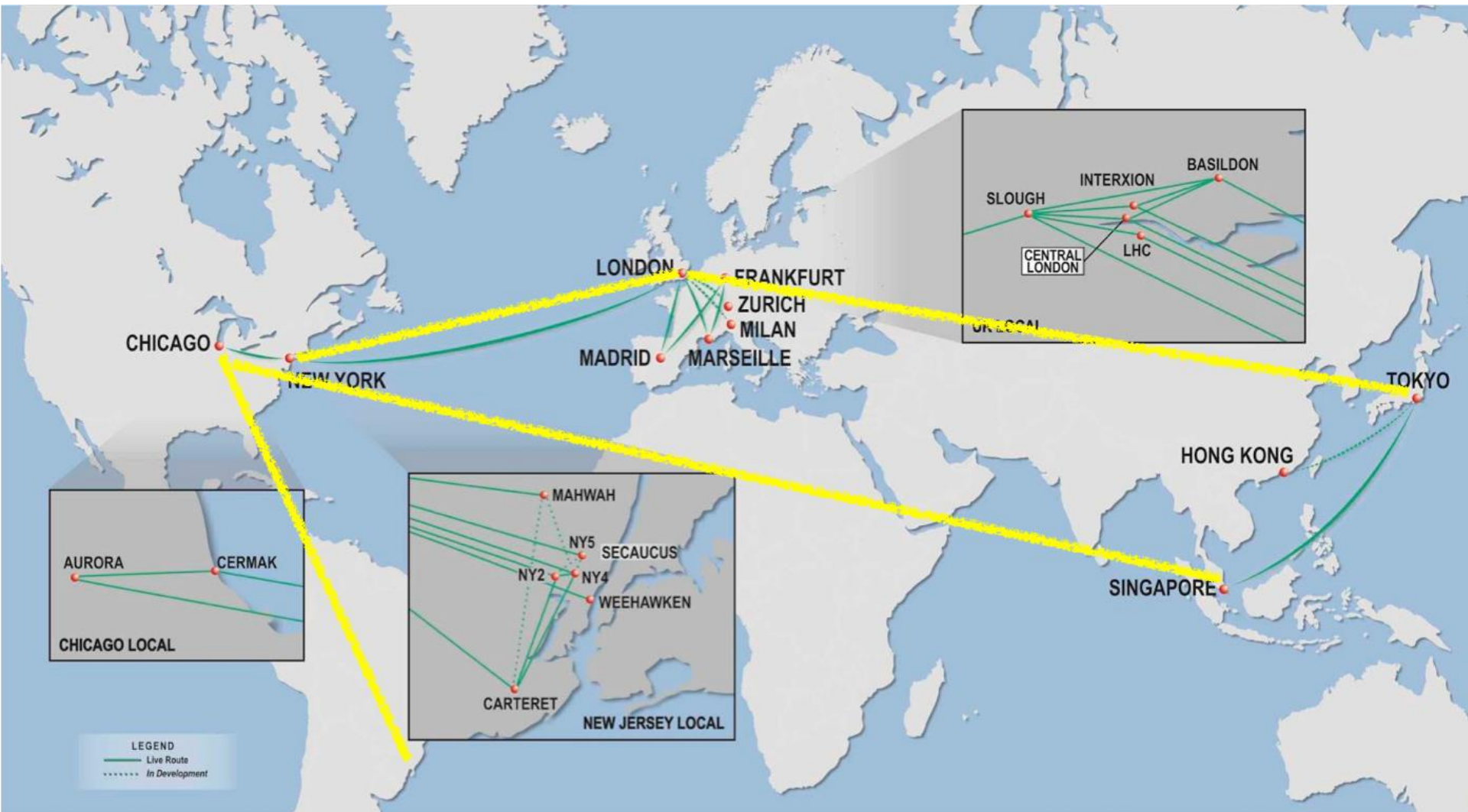
**Latence by sat - Latence by ground
as function of coverage area diameter**

$$\delta_l = 2 * R * \left(\frac{\tan(\alpha) - \alpha}{c} \right) \quad \text{distance} = 2 * \alpha * R$$



Some relevant links

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Simulations (credits to Anis Ayari)

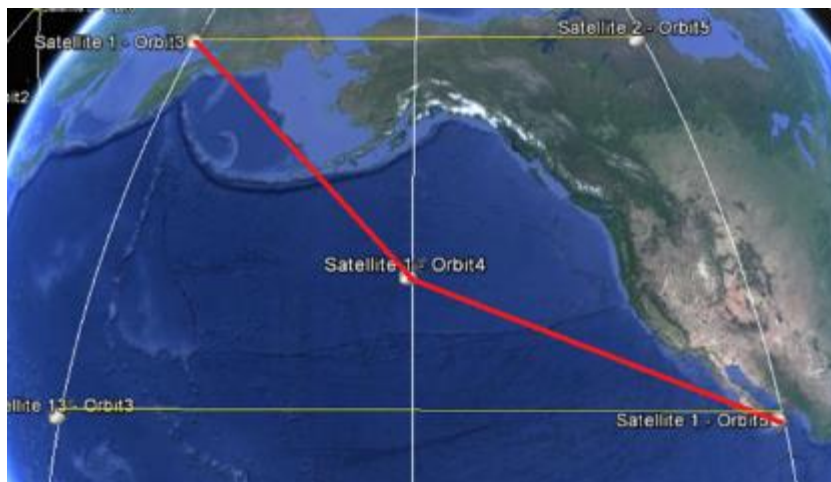
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- Leosat (18°) / SpaceX / Iridium Next (0°)
- 10 x 10 satellite constellation at 700km of altitude with grazing angle and 5000 km max communication distance between four nearest neighbours.

The assumptions are very crude and the simulation results are just a guide to the eye. We have neglected the repeater latency in the satellites.

Connectivity assumptions

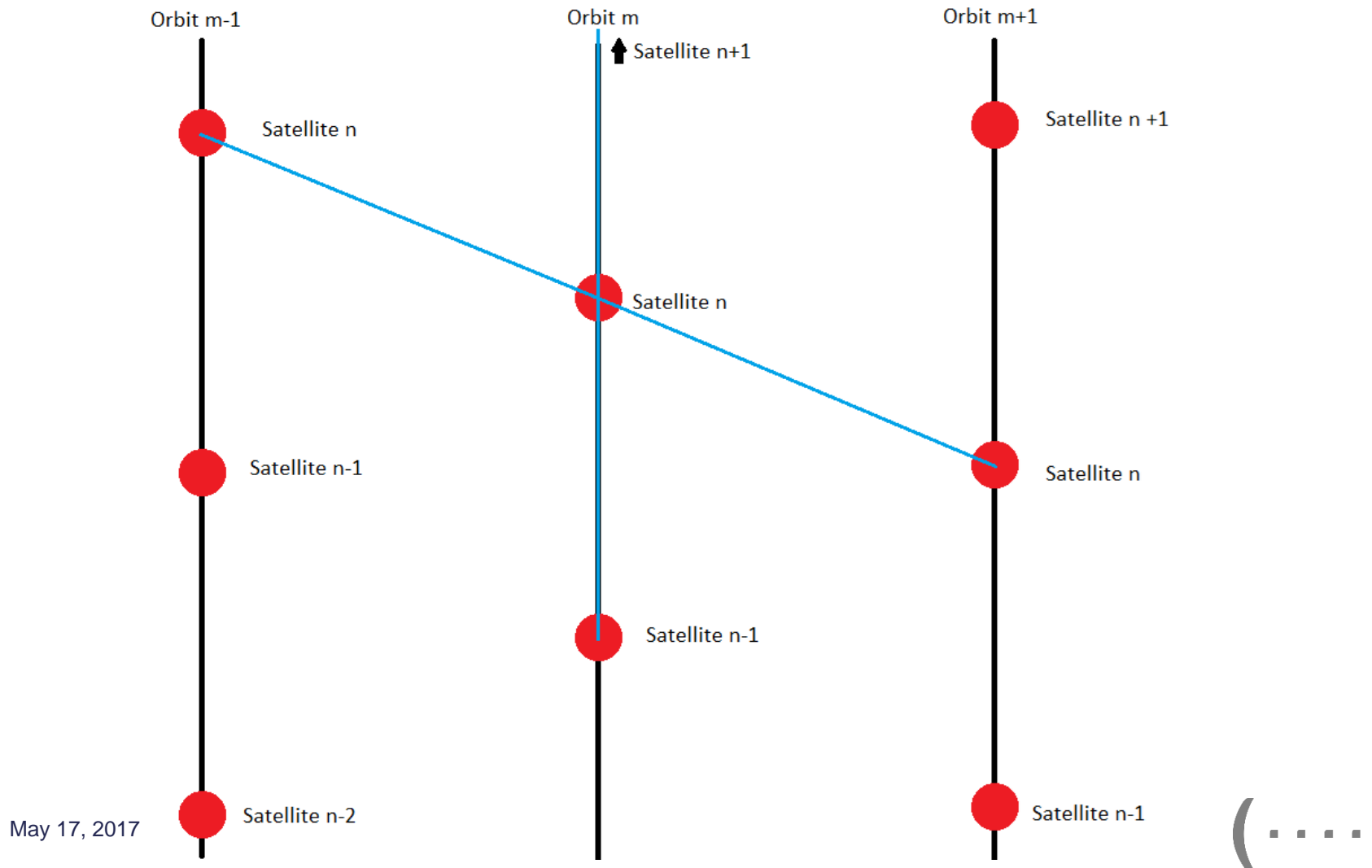
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(...)

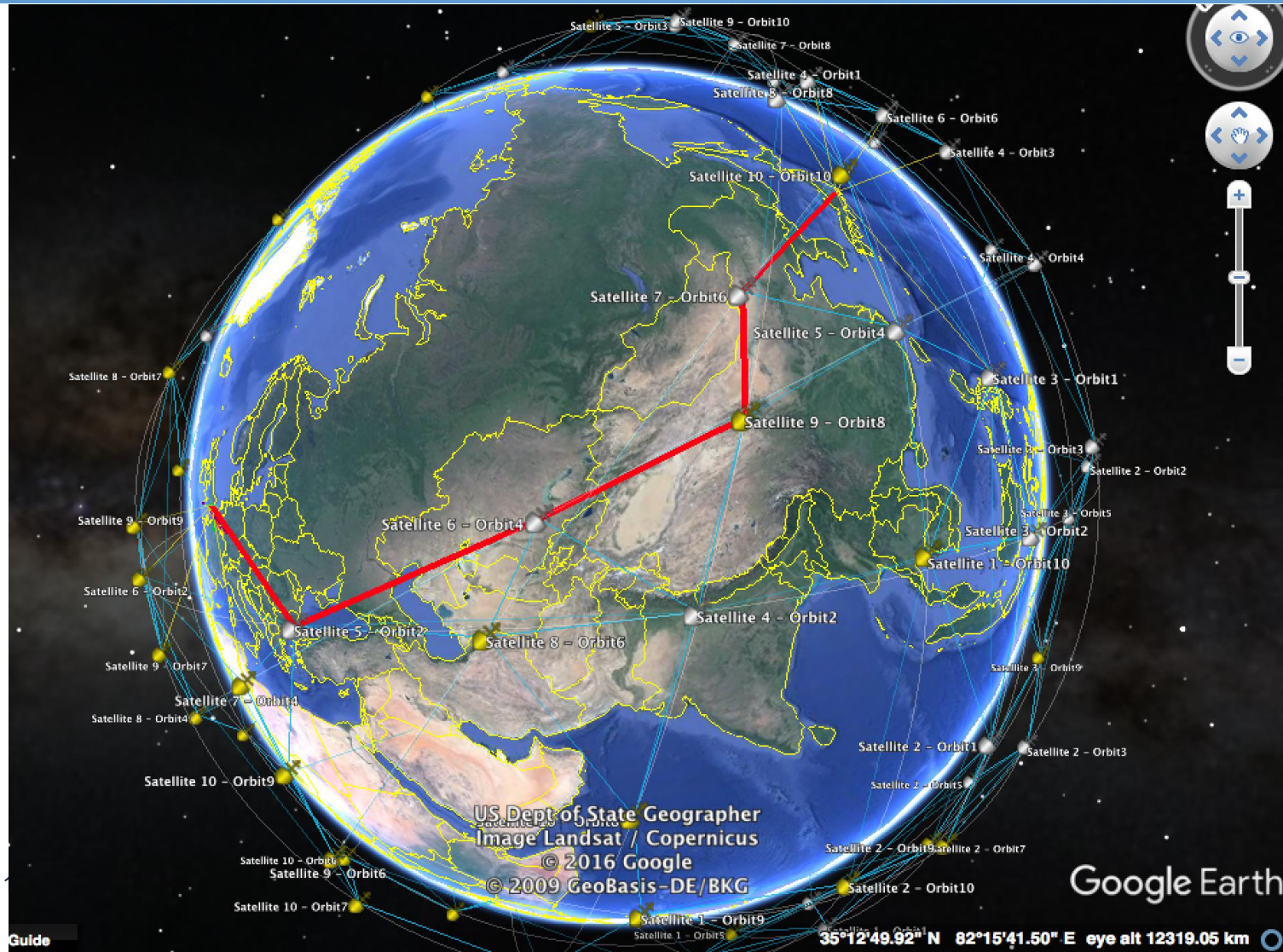
Communication Graph

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Simulation results: good path

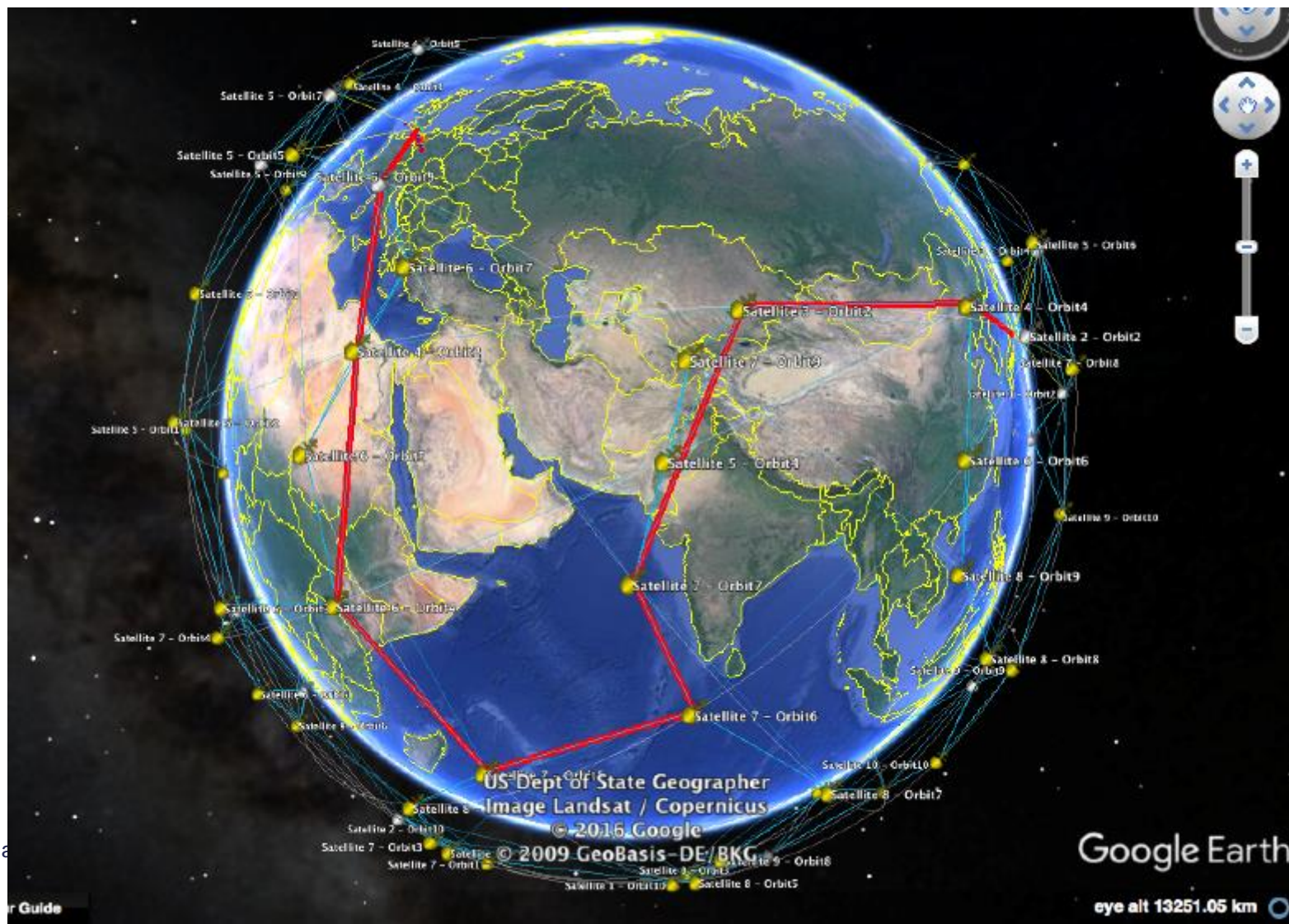
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May

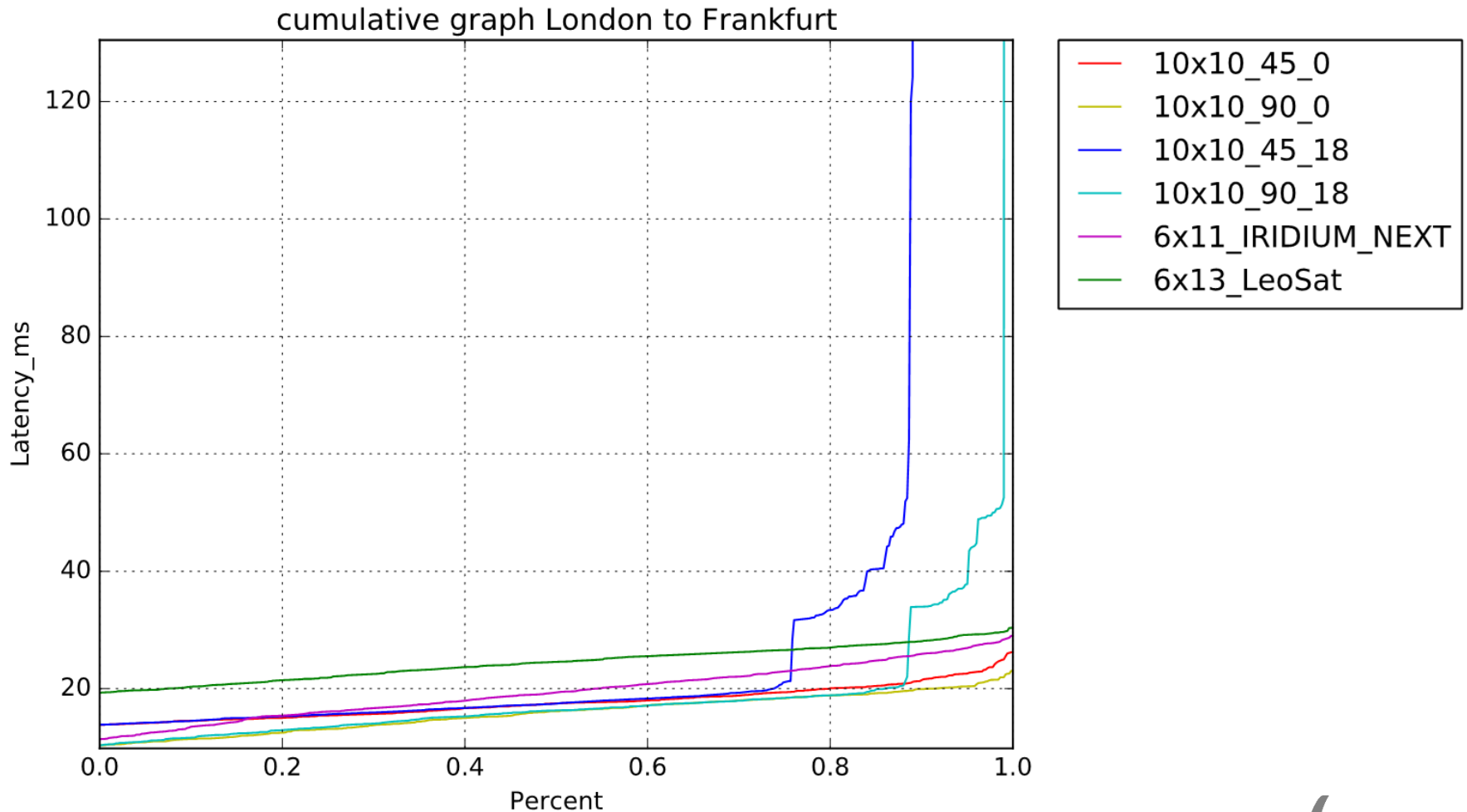
Simulation results: not so good path

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Simulation London to Frankfurt

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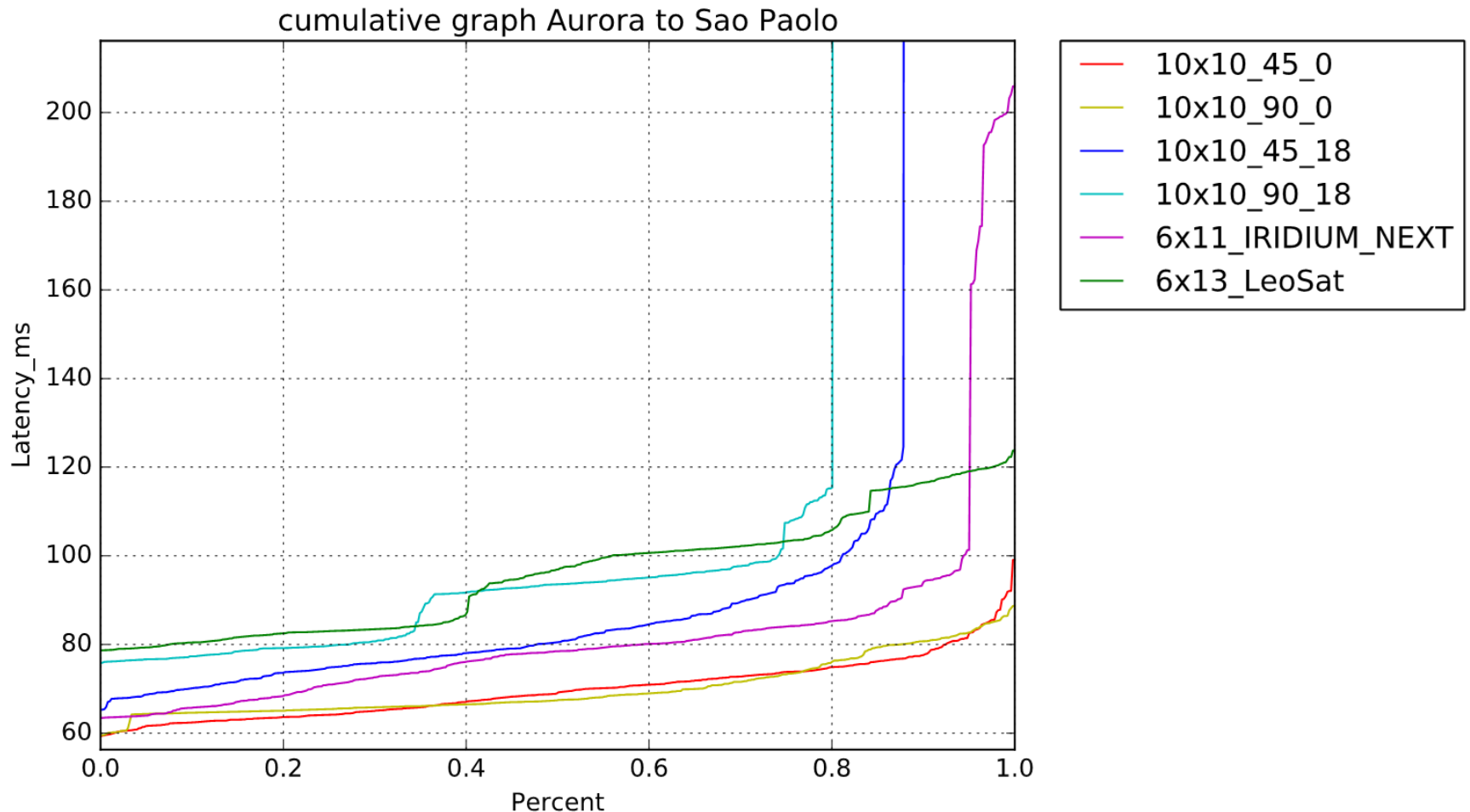


May 17, 2017



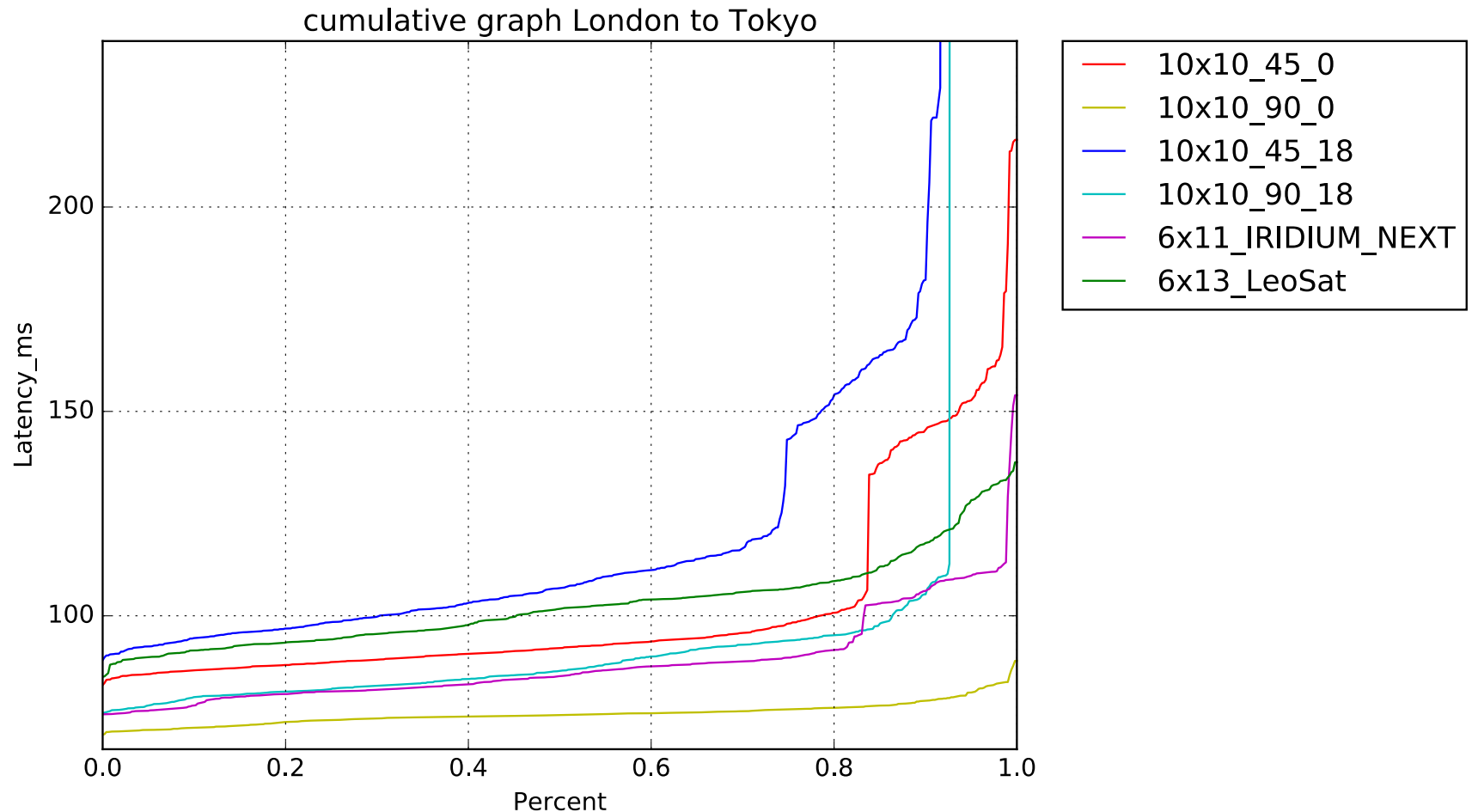
Simulation Aurora to Sao Paolo

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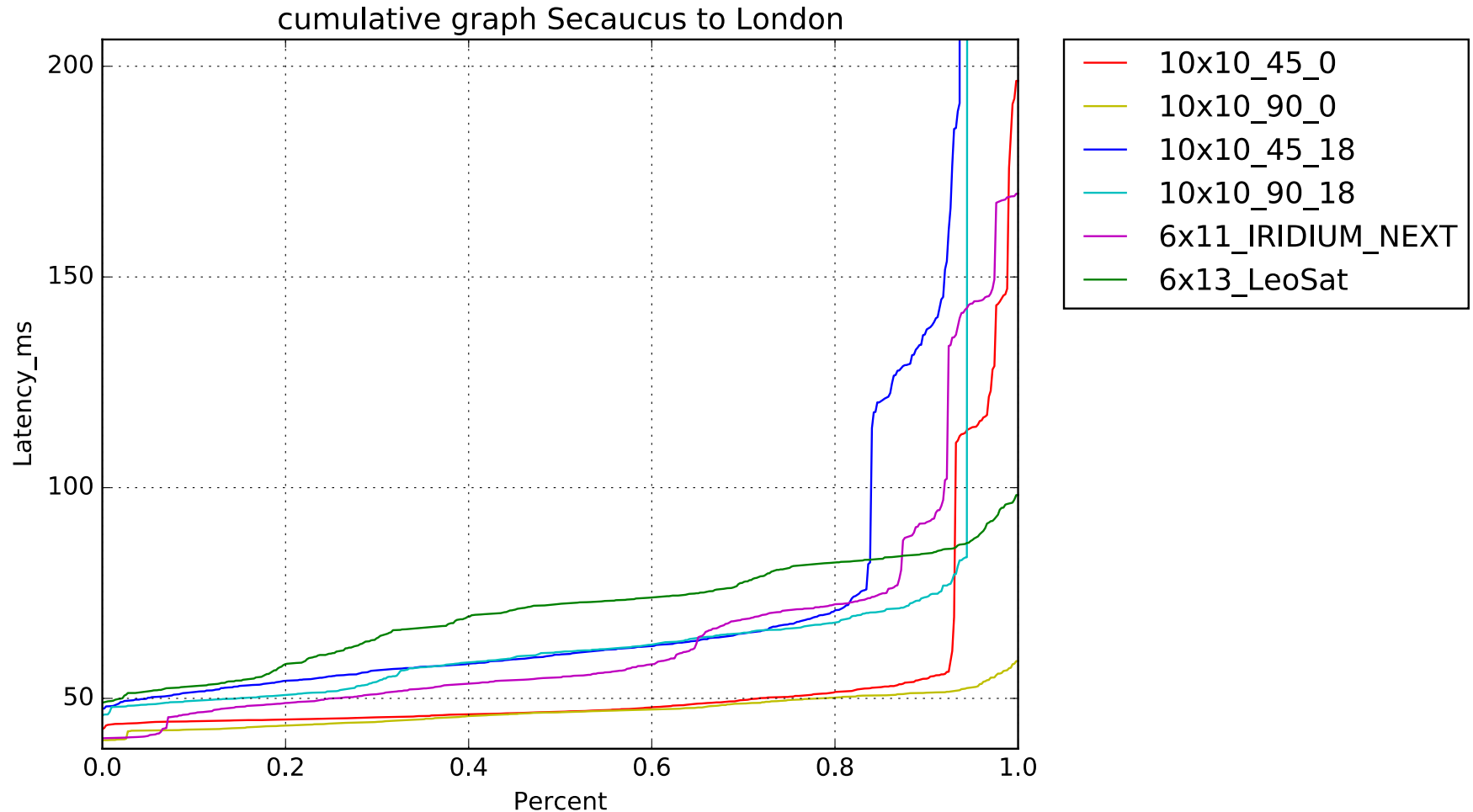
Simulation London to Tokyo

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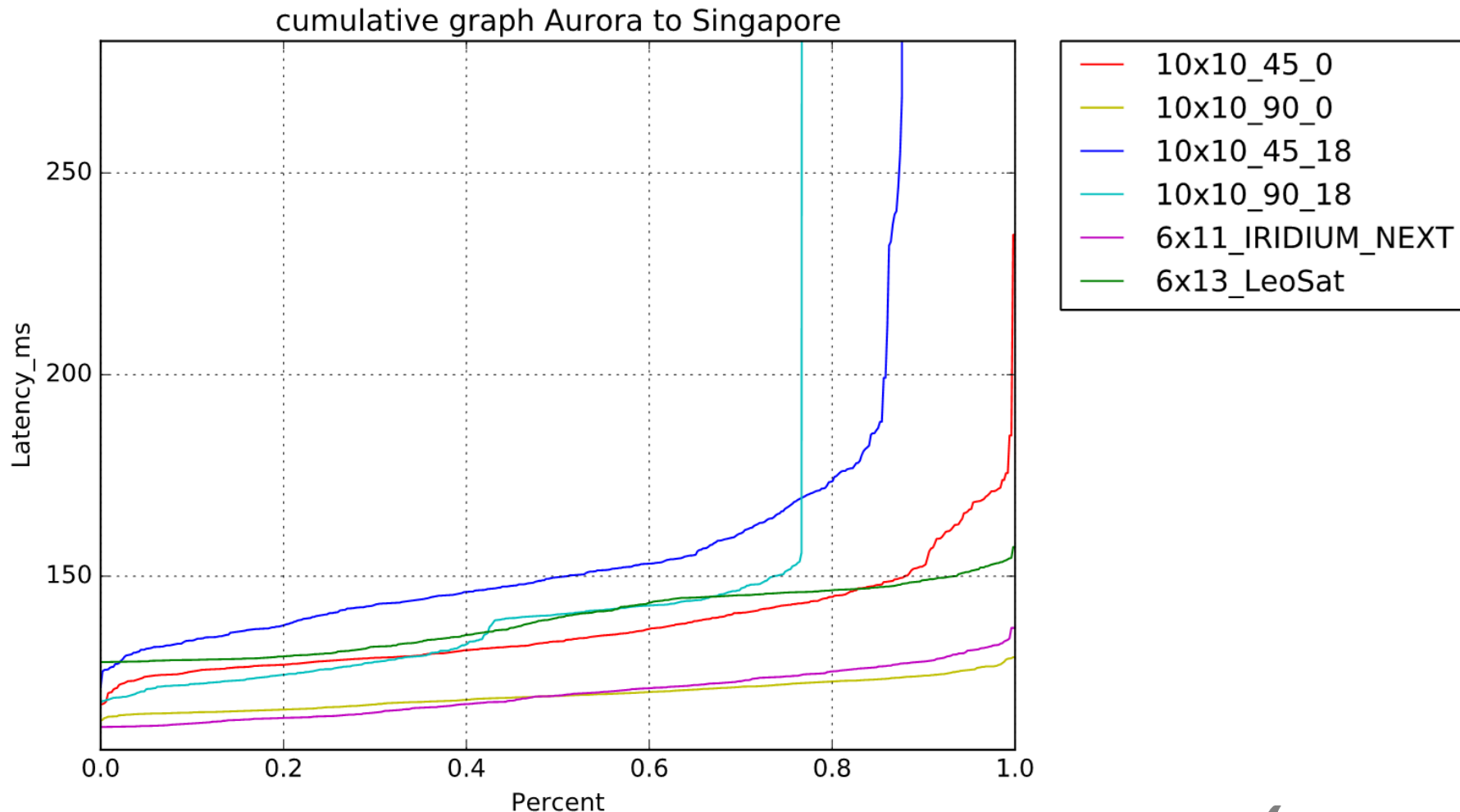
Simulation London to Secaucus

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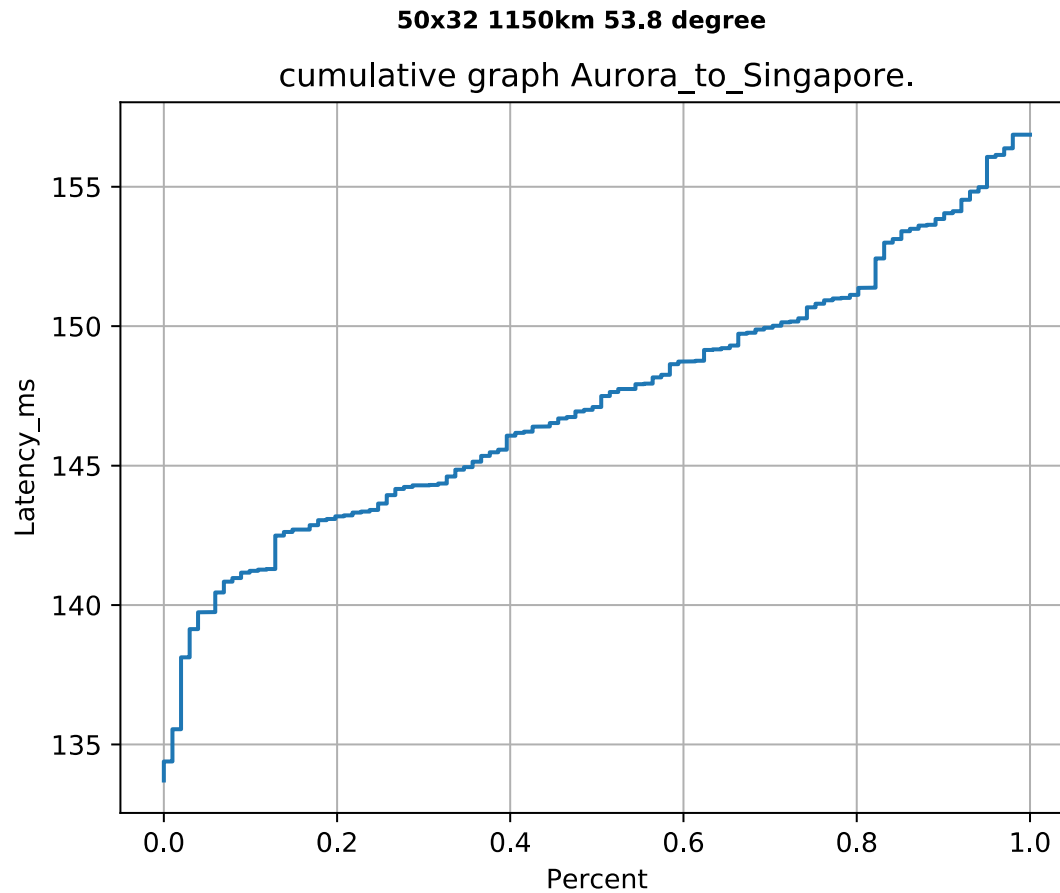
Simulation Aurora to Singapore

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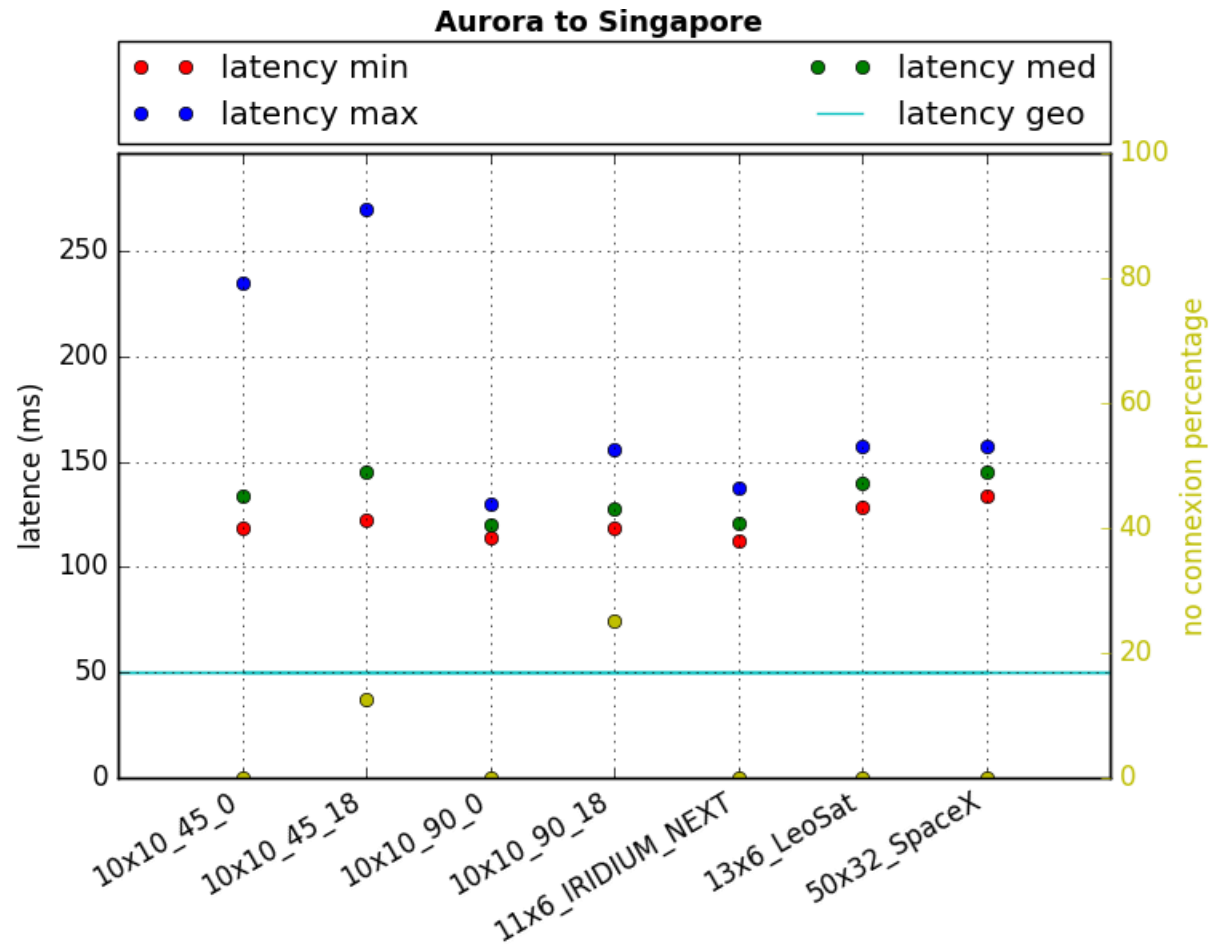
Space X

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Comparing different constellations

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**The race season 6
Satellites will play a role
Hard to tell exactly which**

May 2017

Stéphane Tyč