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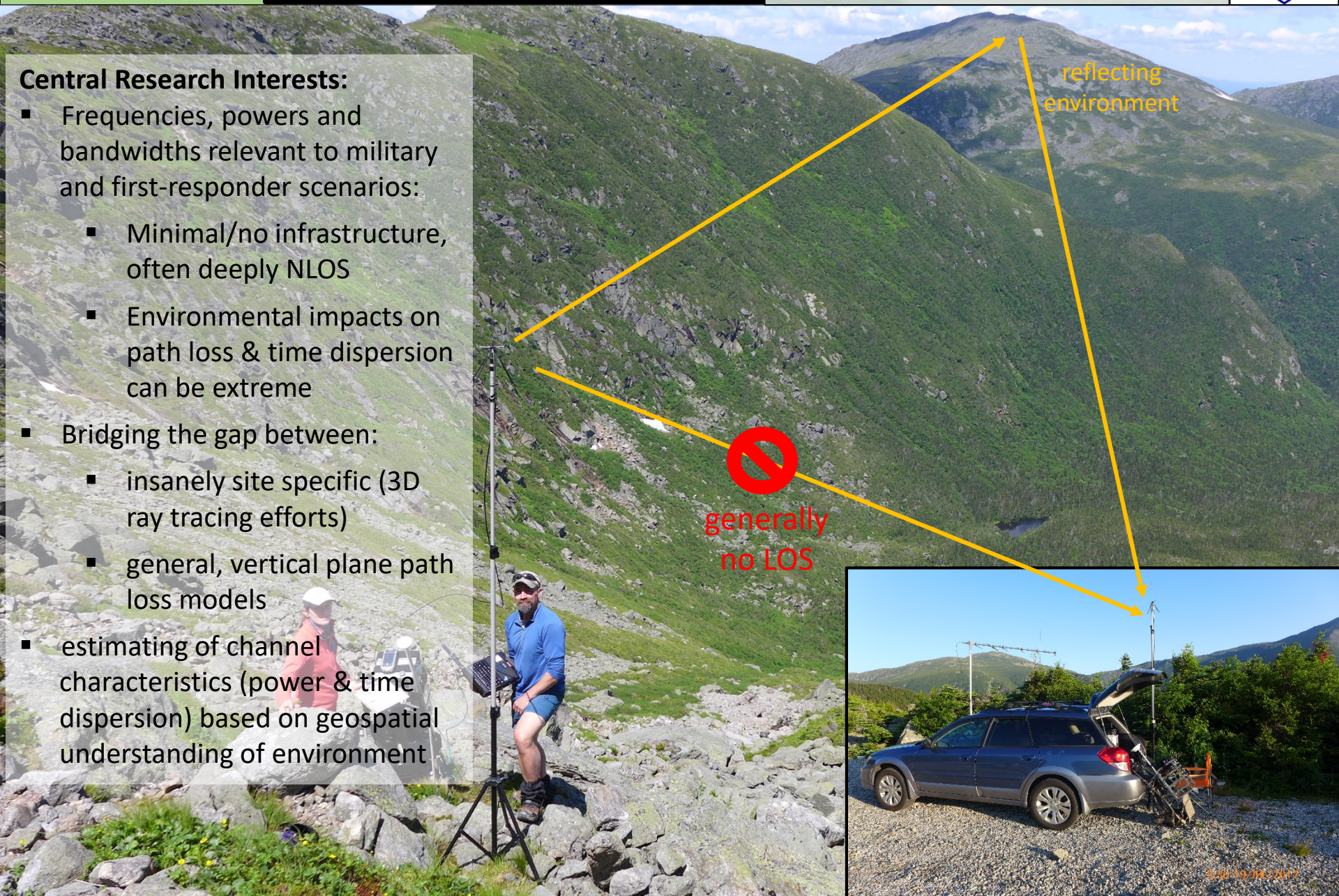
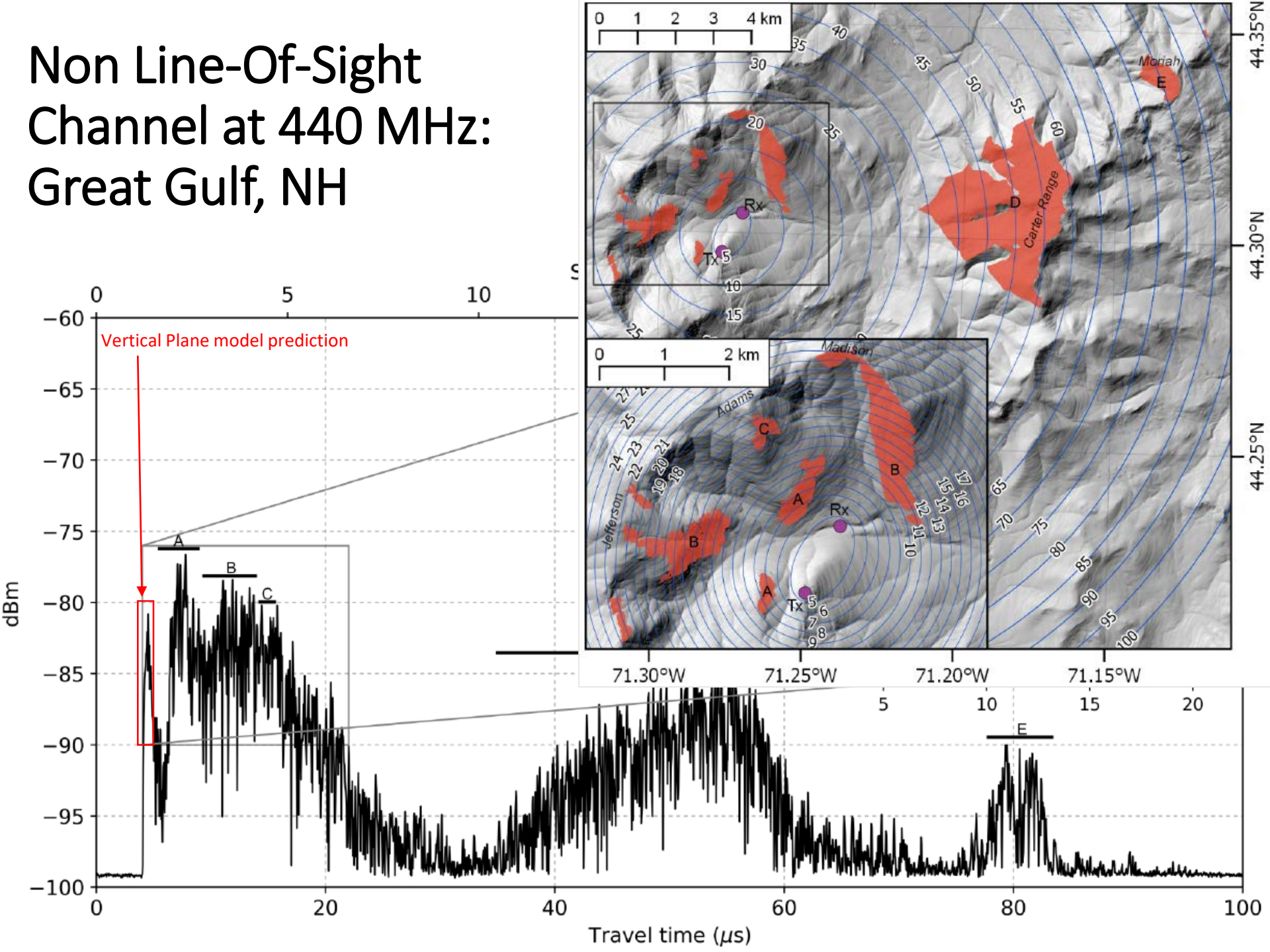
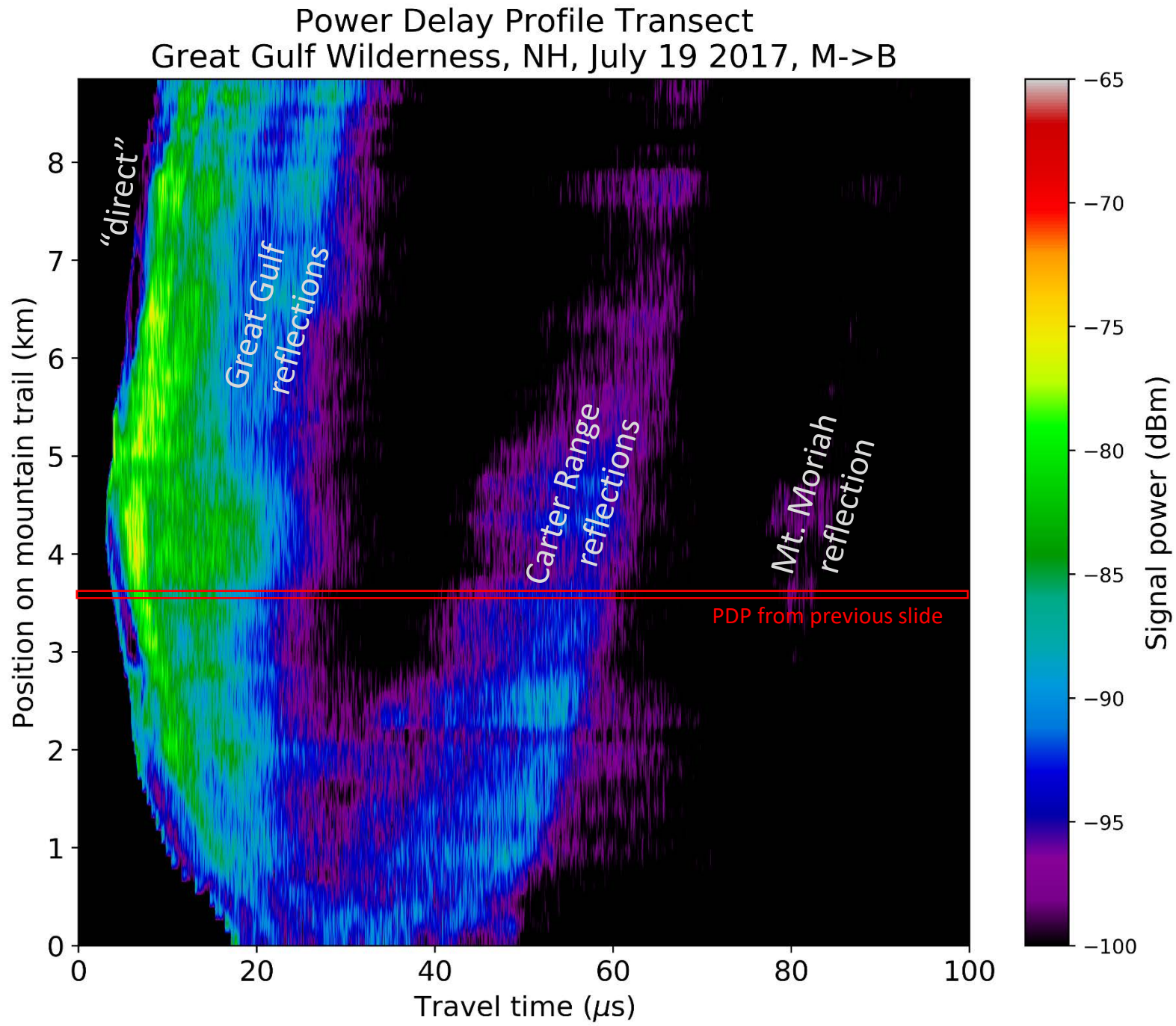
Central Research Interests:

- Frequencies, powers and bandwidths relevant to military and first-responder scenarios:
  - Minimal/no infrastructure, often deeply NLOS
  - Environmental impacts on path loss & time dispersion can be extreme
- Bridging the gap between:
  - insanely site specific (3D ray tracing efforts)
  - general, vertical plane path loss models
- estimating of channel characteristics (power & time dispersion) based on geospatial understanding of environment



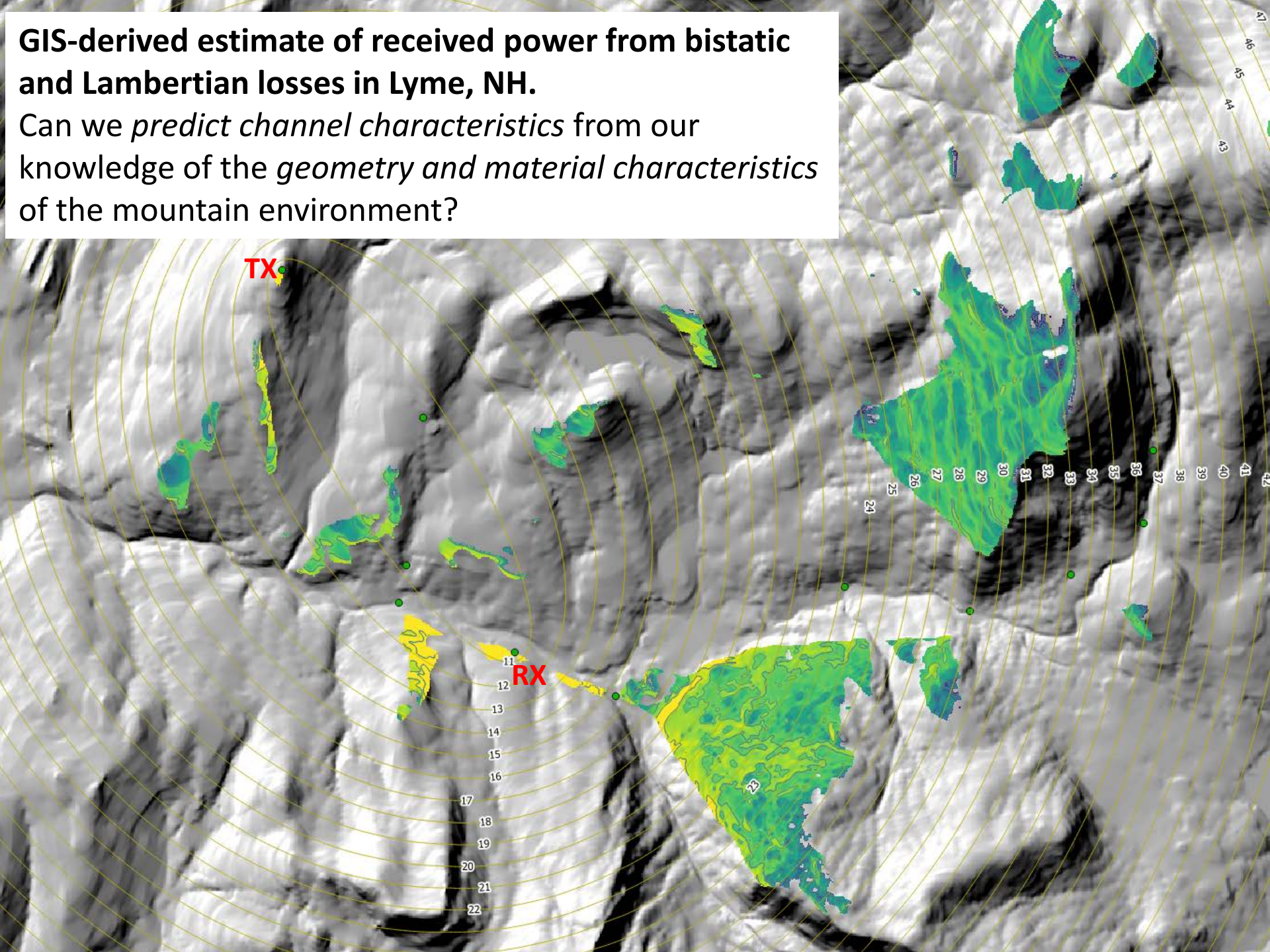
Non Line-Of-Sight Channel at 440 MHz: Great Gulf, NH




Power Delay Profile Transect
Great Gulf Wilderness, NH, July 19 2017, M->B
"direct"
Great Gulf reflections
Carter Range reflections
Mt. Moriah reflection
PDP from previous slide
Position on mountain trail (km)
Travel time (μs)
Signal power (dBm)
0
1
2
3
4
5
6
7
8
0
20
40
60
80
100
−65
−70
−75
−80
−85
−90
−95
−100

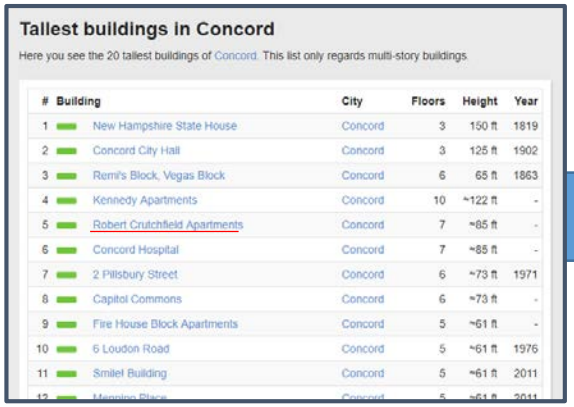
GIS-derived estimate of received power from bistatic and Lambertian losses in Lyme, NH.

Can we *predict channel characteristics* from our knowledge of the *geometry and material characteristics* of the mountain environment?



Geospatially understanding major influences on the urban RF channel

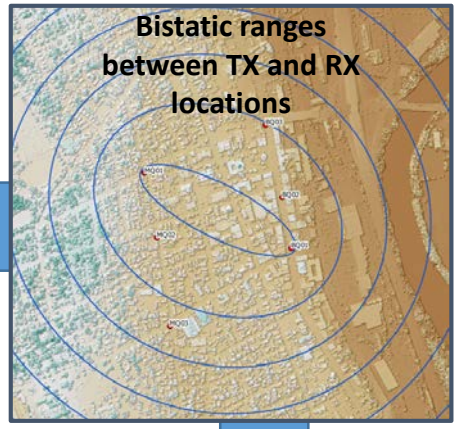
List of possible reflector locations



Tallest buildings in Concord

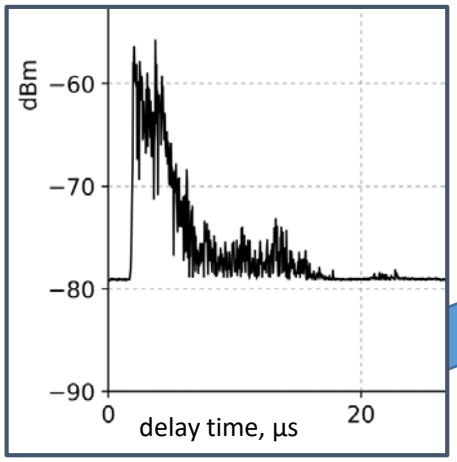
Here you see the 20 tallest buildings of Concord. This list only regards multi-story buildings.

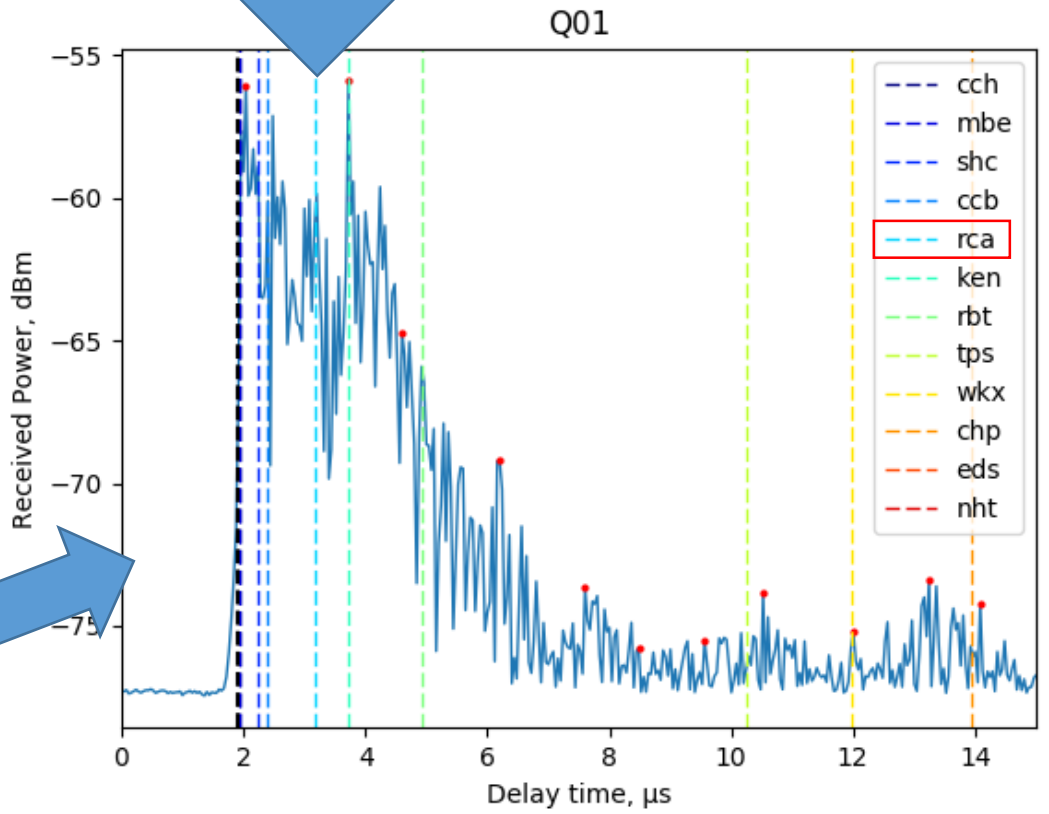
#	Building	City	Floors	Height	Year
1	New Hampshire State House	Concord	3	150 ft	1819
2	Concord City Hall	Concord	3	125 ft	1902
3	Remi's Block, Vegas Block	Concord	6	65 ft	1863
4	Kennedy Apartments	Concord	10	~122 ft	-
5	Robert Crutchfield Apartments	Concord	7	~85 ft	-
6	Concord Hospital	Concord	7	~85 ft	-
7	2 Pillsbury Street	Concord	6	~73 ft	1971
8	Capitol Commons	Concord	6	~73 ft	-
9	Fire House Block Apartments	Concord	5	~61 ft	-
10	6 Loudon Road	Concord	5	~61 ft	1976
11	Smilel Building	Concord	5	~61 ft	2011



calculate bistatic ranges of each possible reflector with respect to TX and RX locations

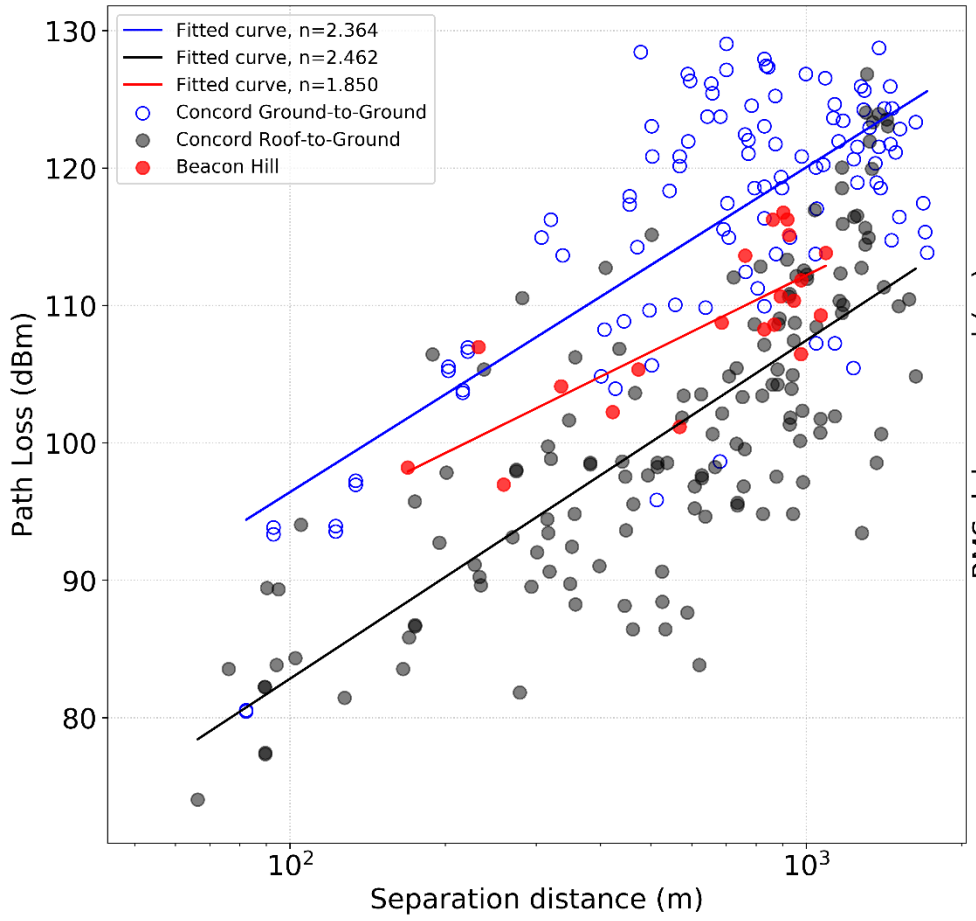
PDP collected between known TX and RX locations

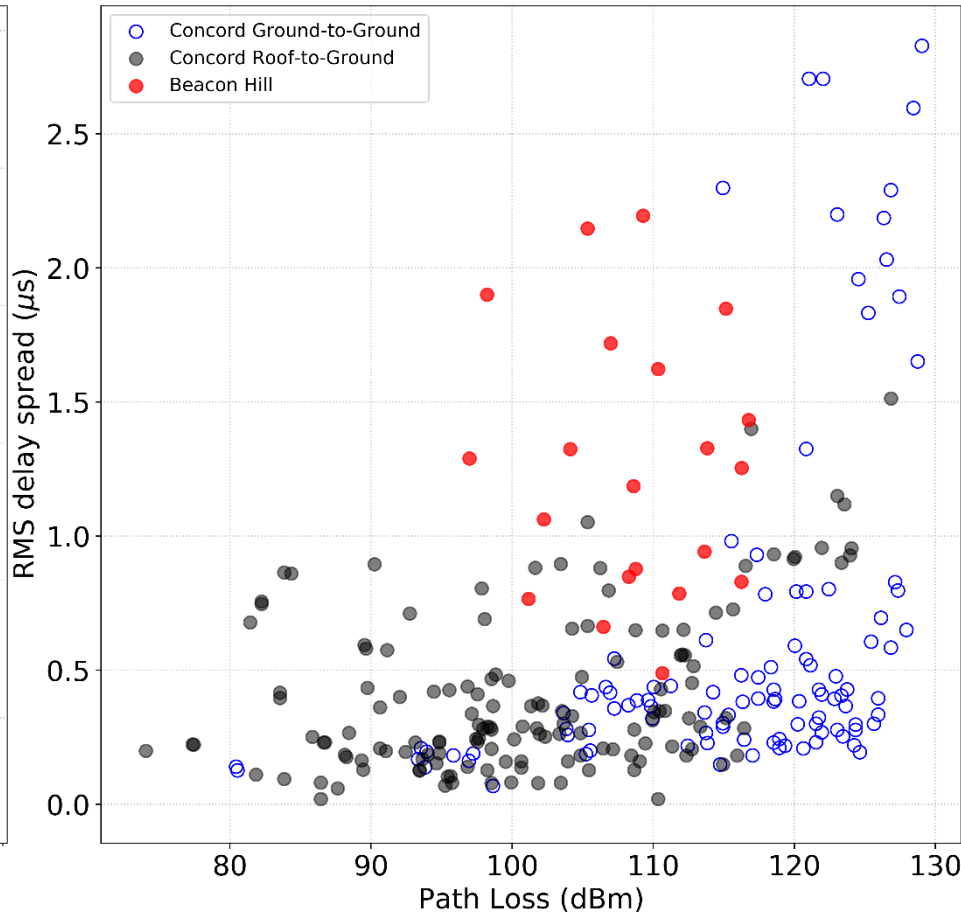




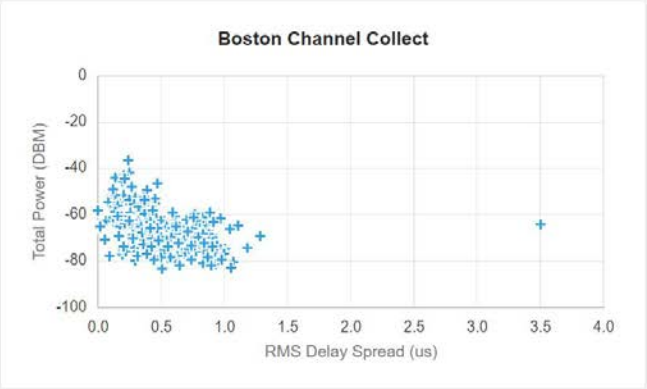
How can we enhance our geospatial understanding of classic measures propagation?

How much spatial variability is related to imperfect environmental knowledge?

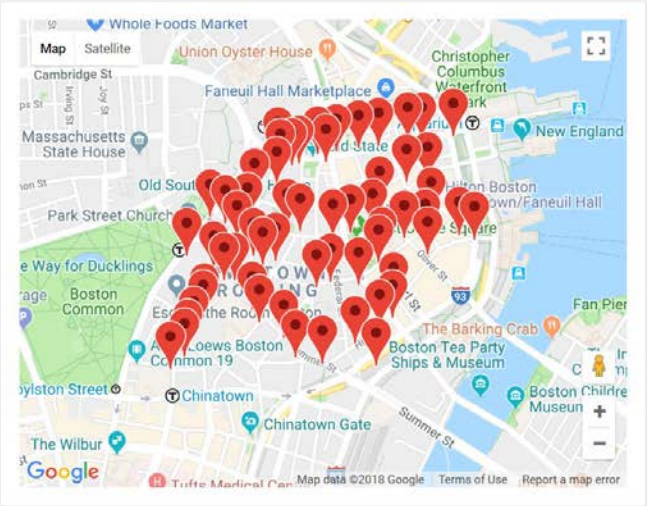




Recent efforts with geo-database to help interpret urban channel sounding campaign data in Boston



Map Container



Collection id	Total recv power dbm	Delay time ave sec	Delay time min sec	Delay time max sec	Gps seperation dist m	Dynamic range dbm	Path loss dbm	Date time linux
DT085	-59.1	1.645	1.401	.52	-	-62.026	-62.026	06-JUN-18
DT086	-68	2.277	1.481	1.601	-	-58.7	-58.7	06-JUN-18
DT087	-66.2	2.323	1.401	1.841	-	-58.526	-58.526	06-JUN-18
DT088	-61.5	1.876	1.401	.96	-	-58.661	-58.661	06-JUN-18
DT089	-65.7	1.89	1.441	.92	-	-58.377	-58.377	06-JUN-18
DT090	-66	2.576	1.401	2.321	-	-56.849	-56.849	06-JUN-18
DT091	-53.4	1.491	1.16	.68	-	-54.144	-54.144	06-JUN-18
DT092	-64.4	1.62	1.361	.56	-	-49.463	-49.463	06-JUN-18
DT093	-62	1.56	1.2	.76	-	-55.482	-55.482	06-JUN-18
DT094	-65.3	2.074	1.2	1.761	-	-53.059	-53.059	06-JUN-18
DT095	-70.4	2.125	1.12	2.041	-	-55.744	-55.744	06-JUN-18
DT096	-70.1	1.803	1.24	1.16	-	-55.914	-55.914	06-JUN-18
DT097	-60.9	2.199	1.561	1.321	-	-61.848	-61.848	06-JUN-18

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