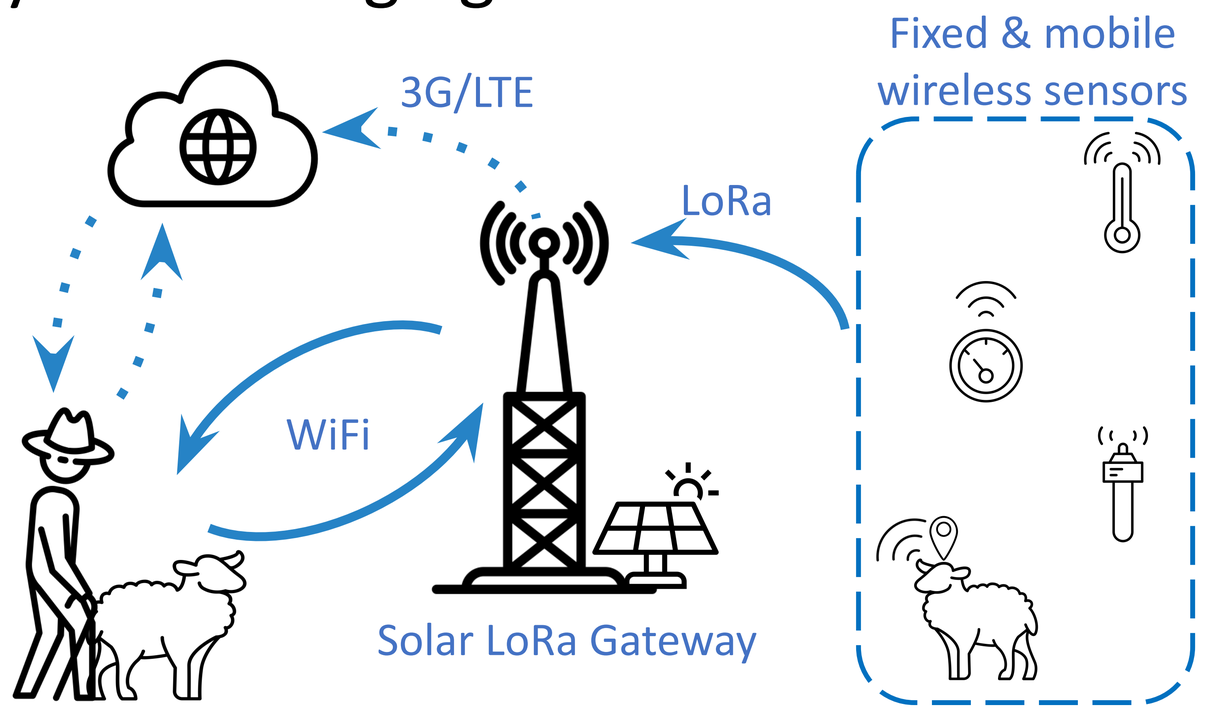
Connecting animals and shepherds : Bringing LoRa connectivity to challenging terrains

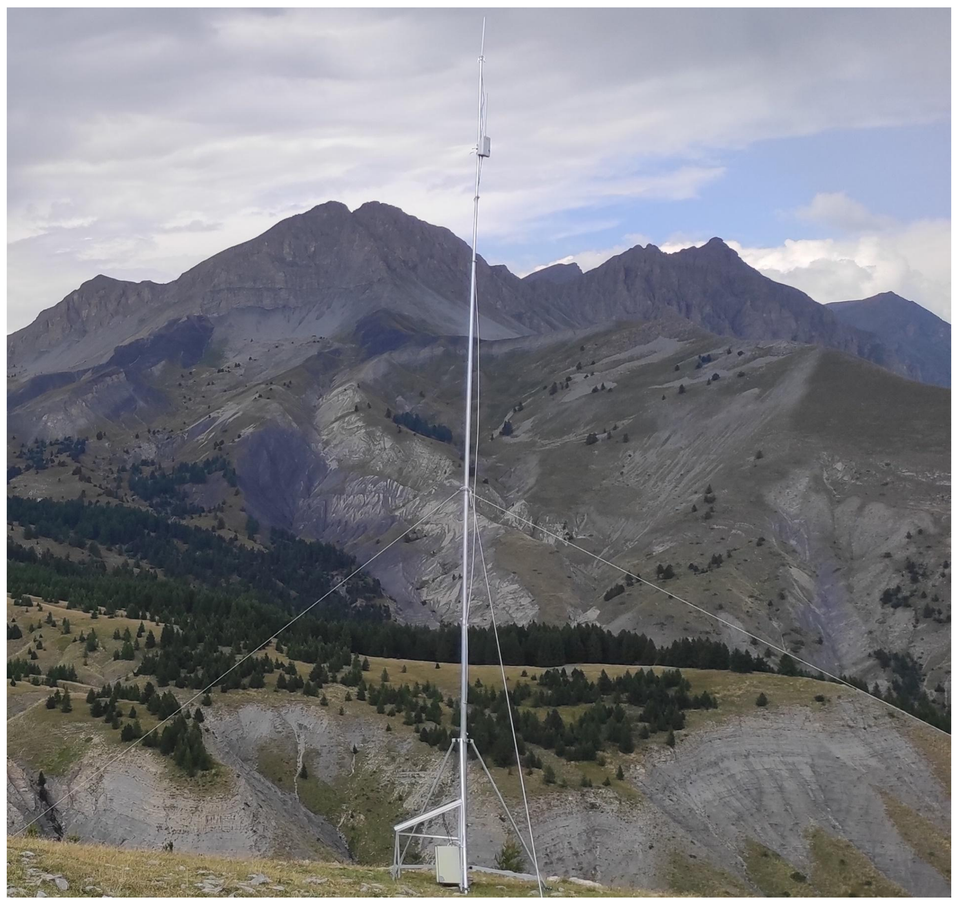
CONTEXT

In remote and mountainous areas, unreliable mobile networks hinder the adoption of connectivity -dependent digital technologies for shepherds and livestock monitoring. **Deploying a LoRa network in wide, hard-to-reach areas with limited resources poses significant challenges but careful planning for optimal coverage make it a valuable solution.** LoRa networks offer long-range connectivity, low power consumption, scalability, and robustness, enabling efficient connectivity for a large number of digital tools in remote and challenging terrains.



MATERIALS

- 5.77 km² study area (French Alps, Mercantour National Park)
- 1505 m to 2109 m altitude
- LoRa Gateway solar stations on up to 16m high masts



METHODS

- Radio coverage simulated beforehand
  - **I**rregular **T**errain **M**odel tool with local topographic data
- Coverage simulation tested on-site
  - Area divided in a 400m grid (33 x 0.16km² zones, 5.28km²)
  - Geocoded messages sent from embarked GNSS modules
    - At least one transmission at each grid vertex (n=57)

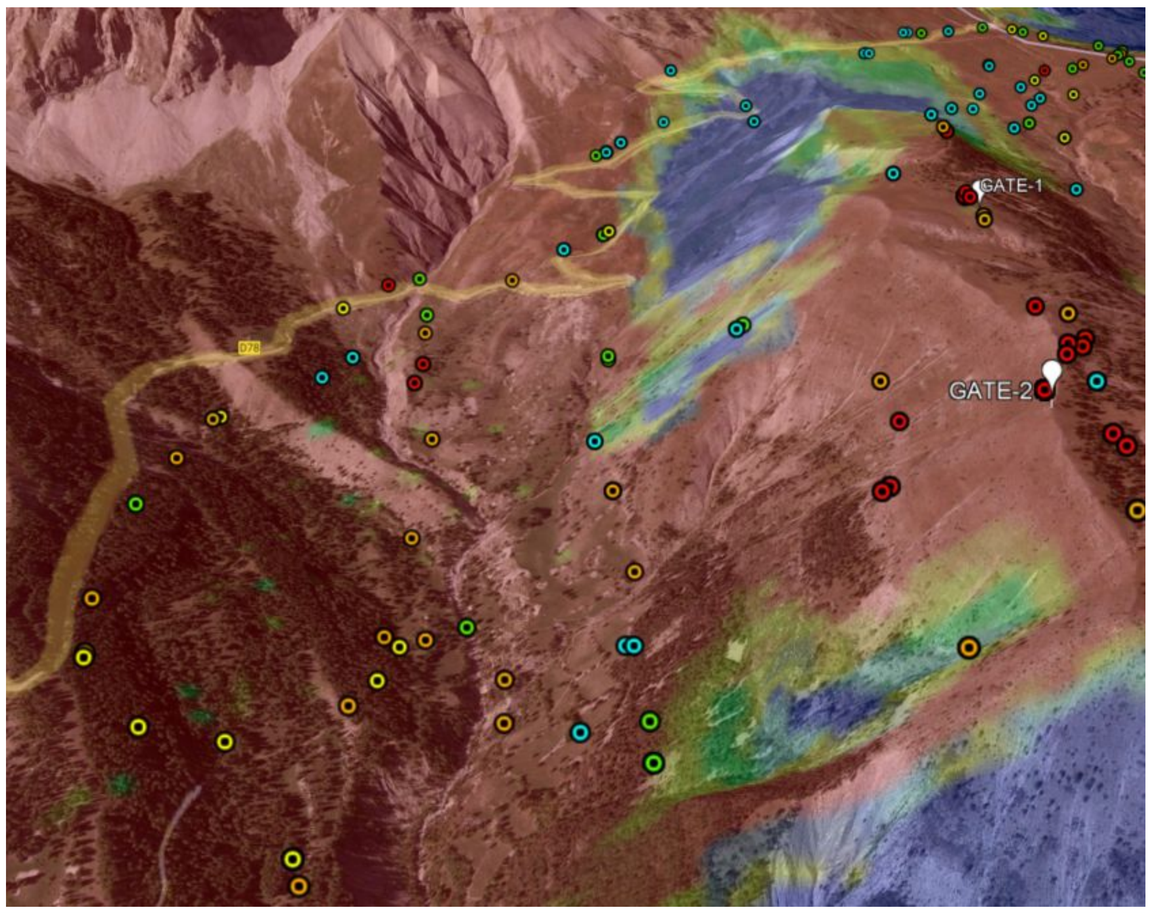
RESULTS

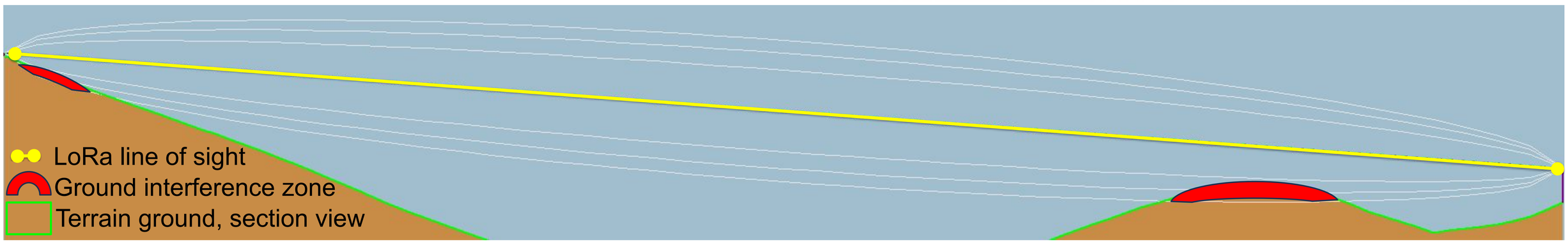
ITM simulation determined placing two LoRa gateways on a central mountain ridge would provide satisfactory coverage (2006 and 2049 m in altitude)

- ITM provided a **coverage forecast map** (on the right)
- **Line of Sight projections** were made available for the most extreme cases (below)
- A total of 377 messages were received (176 by GATE-1, 201 by GATE-2) covering a 4,56 km² area

On-site transmissions signal strenghts were transposed on the coverage map

- From 57 transmission attempts taken on the grid vertices, 1 failed against the model's expectation at its vertex and 1 succeeded in the opposite situation





CONCLUSIONS

LoRa networks prove to be resilient to highly uneven terrain and showed overall great performances at reduced costs. The coverage simulation allowed to accurately plan the gateways deployment to prevent unnecessary efforts on site.

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