



Surface Waves for Communication Systems



This programme of research (SEAS DTC CC012) investigates the phenomenon of surface waves and aims to identify methods to utilise them for a covert communication system. Surface waves are waves that travel along the air-ground interface and are frequently considered as a loss mechanism. The aim of this research is to be able to preferentially launch the surface wave, where the space wave will be considered the loss mechanism instead.

Aim

To carry out research to underpin the development of a covert communications system utilising a surface wave launch and receive mechanism in place of conventional antennas.

Approach

The factors affecting surface waves were investigated using simulations mainly in HFSS with a limited measurement campaign.

Outcomes

Better understanding of the factors affecting surface wave propagation which can be applied to launcher design and future research.

What?

A **surface wave** is one that propagates along an interface between two different media without radiation.

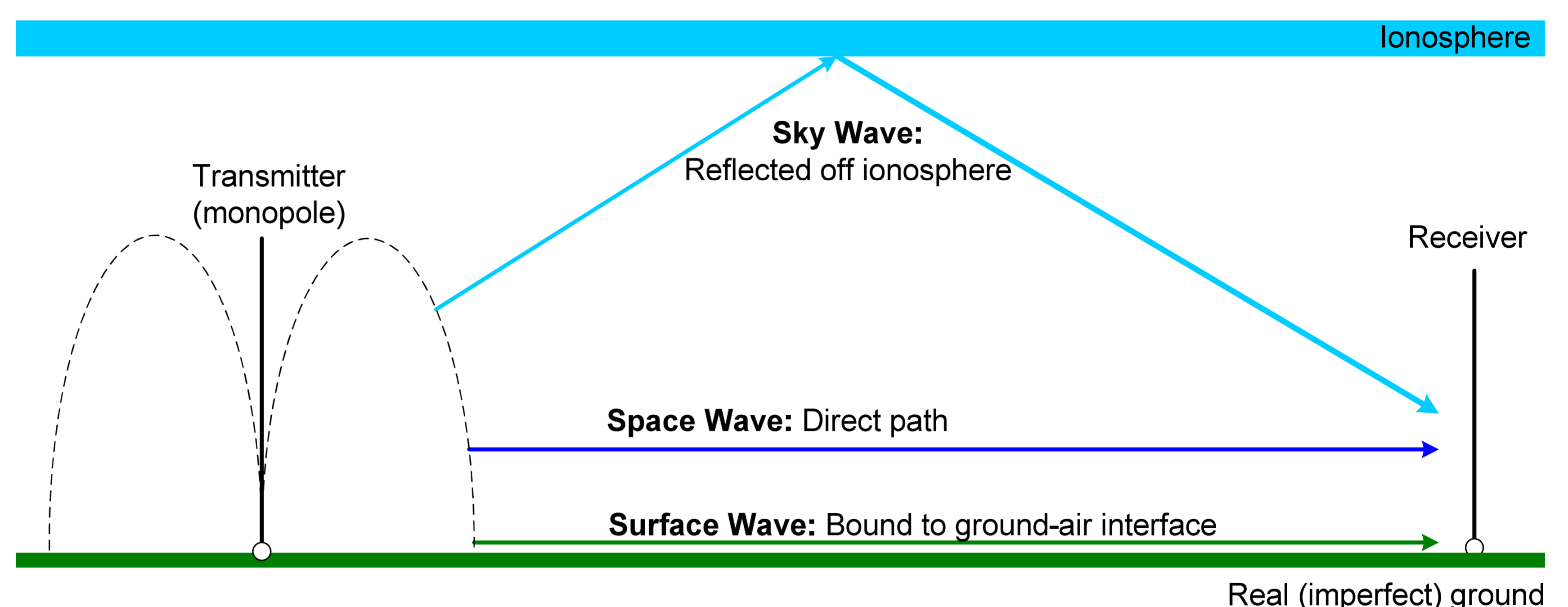


Figure 1 Diagram to show differences between surface, space and sky waves

Why?

- Potential **reduced device power requirements** to transmit the same signal strength, increasing battery life or reducing battery weight;
- Possible **increased range** for same signal strength when compared to a standard antenna
- Has **terrain following** potential. Could allow over-the-horizon comms
- Since wave is bound to interface there is a **reduced probability of interception**

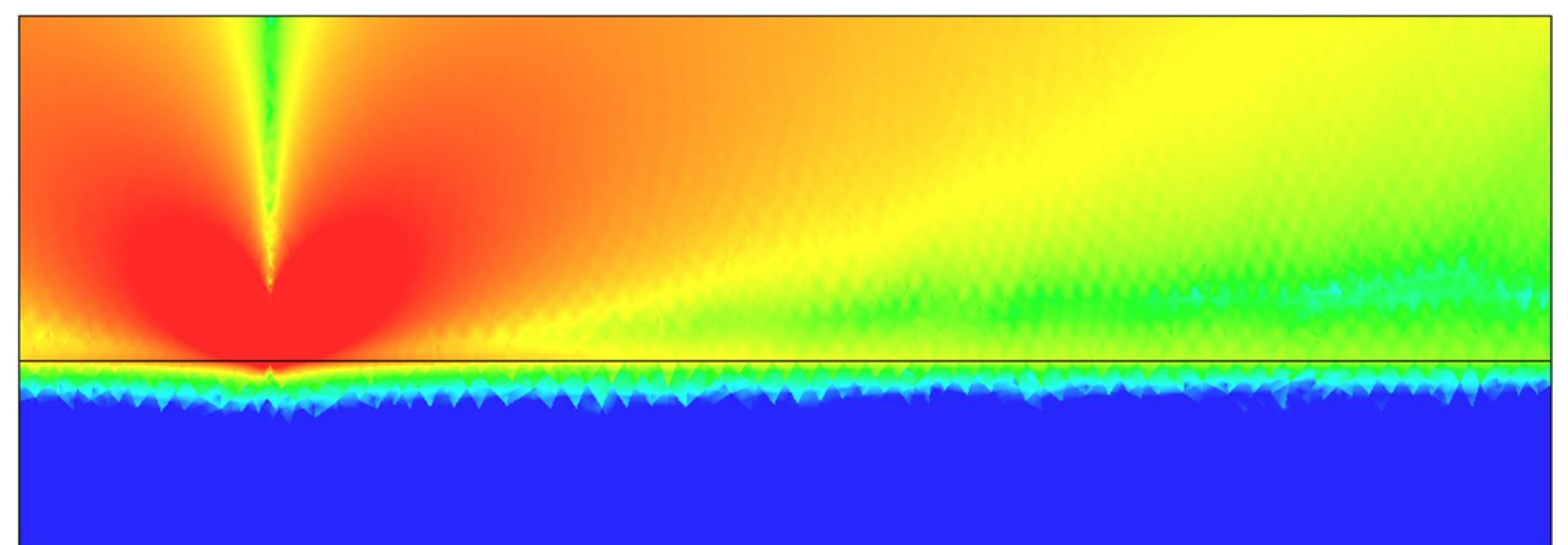


Figure 3 Simulation of magnitude of electric field over average ground

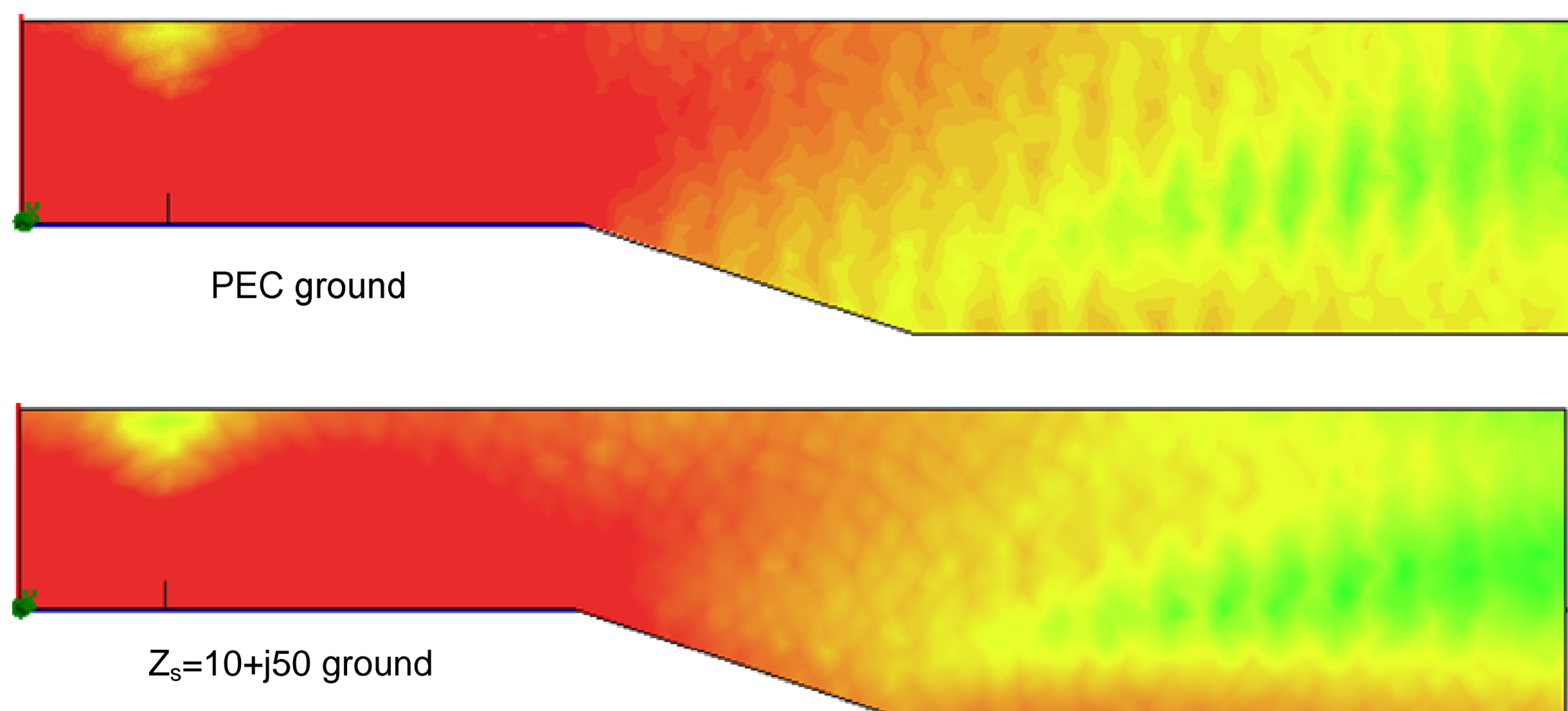


Figure 2 Highly indicative simulation of terrain following (magnitude of electric field)

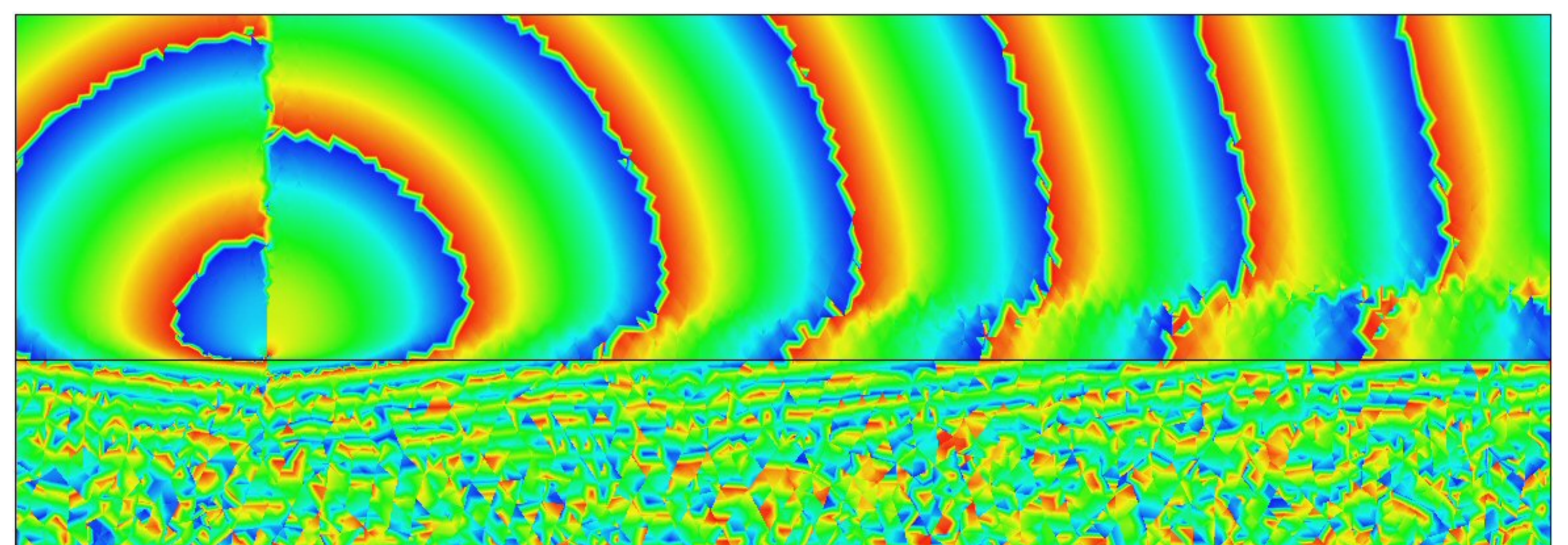


Figure 4 The same simulation as Figure 3 but showing phase information. This result is highly indicative of a surface wave being present

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Acknowledgements:

- This work will form part of an EngD thesis at UCL with tuition fees funded by EPSRC
- Mike Jessup, Robert Whitehouse & Steve Simpson of Roke assisted during this work