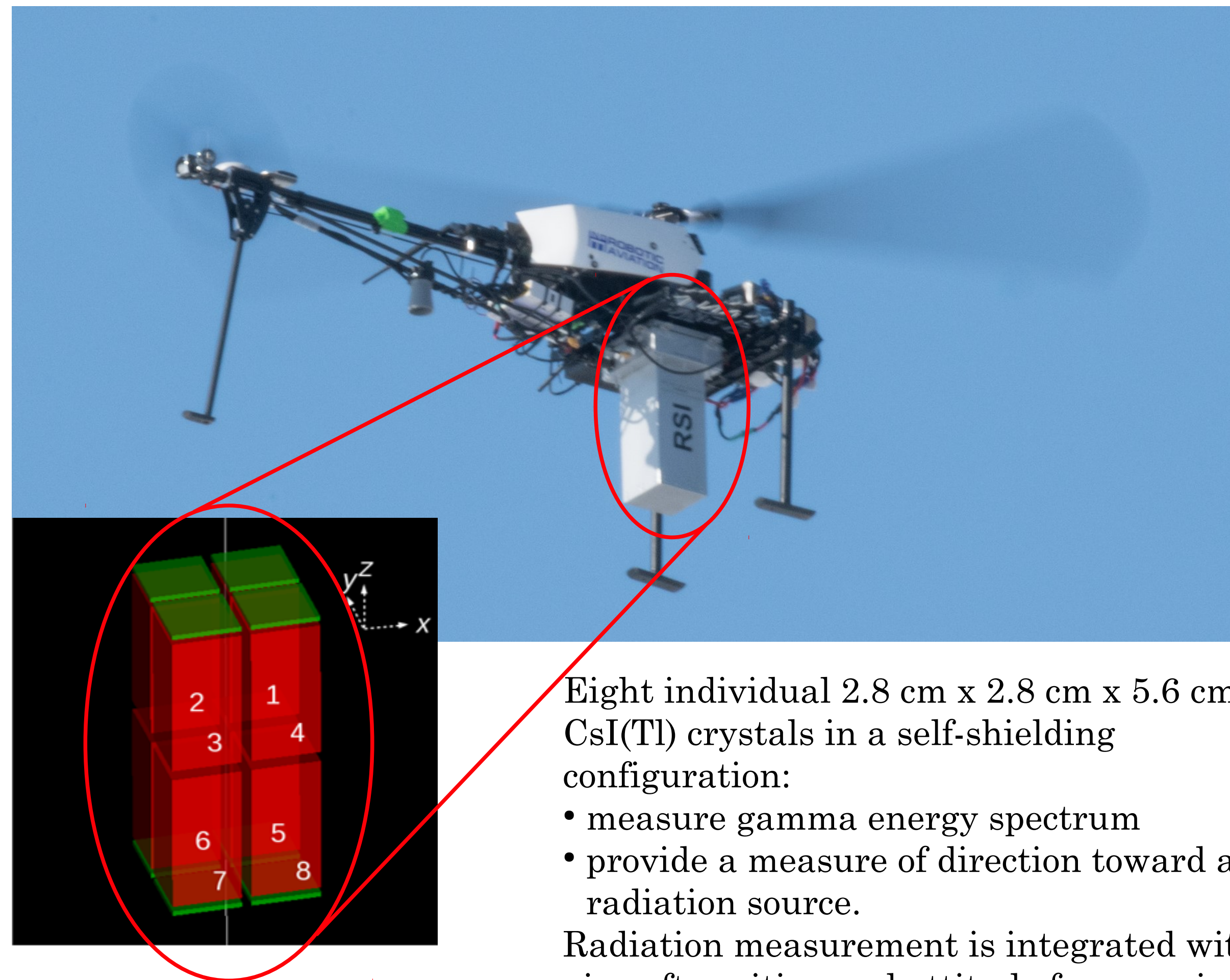




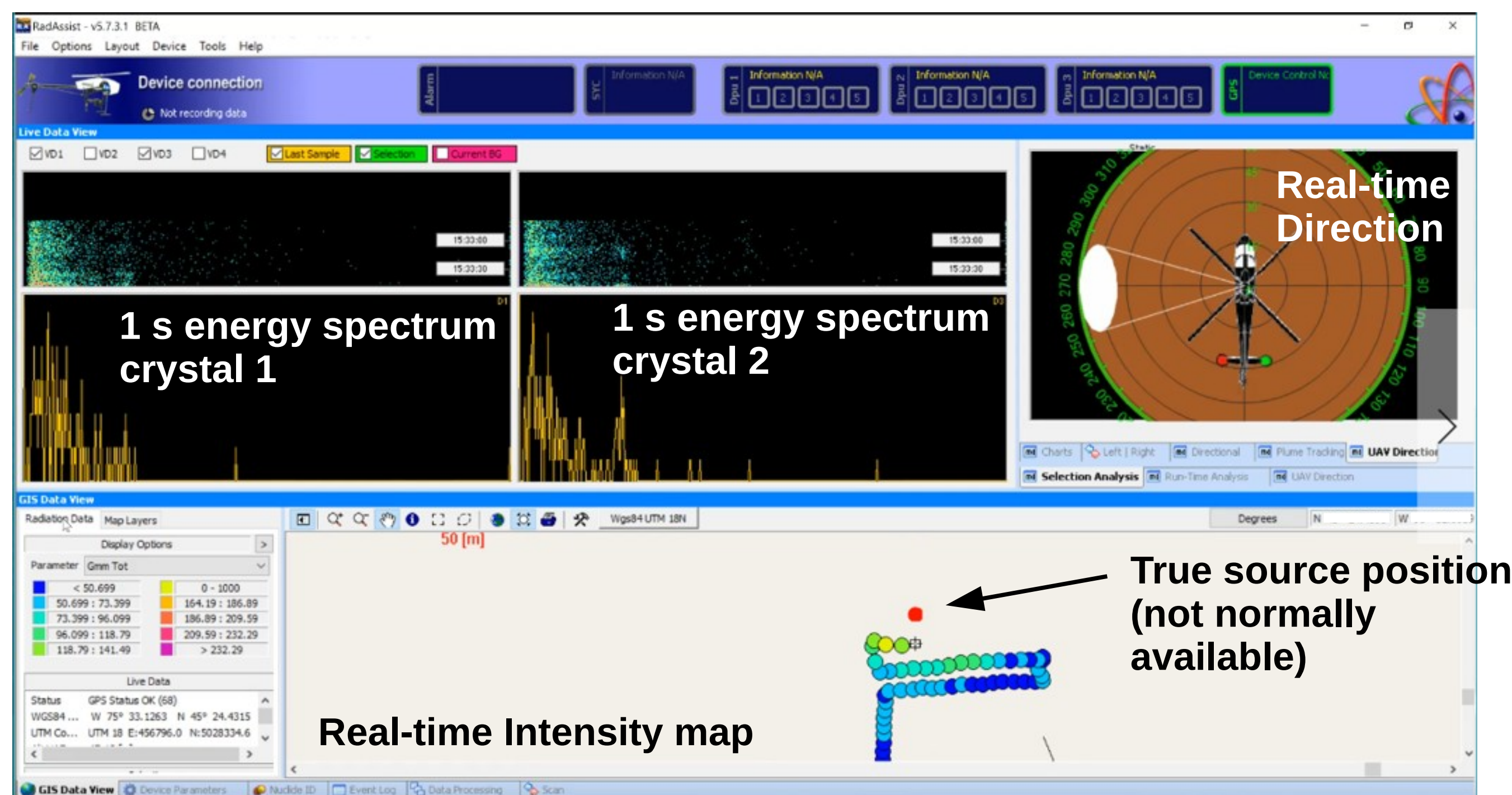
Advanced Radiation Detector for UAV Operations (ARDUO)



Eight individual 2.8 cm x 2.8 cm x 5.6 cm³ CsI(Tl) crystals in a self-shielding configuration:

- measure gamma energy spectrum
- provide a measure of direction toward a radiation source.

Radiation measurement is integrated with aircraft position and attitude for mapping.



Conclusions

Experimental trials have been conducted flying a direction-capable gamma spectrometer on board a UAV over a variety of point and extended radiation sources.

- Direction-sensing provides improved spatial precision of source location determined from aerial gamma spectrometer survey.
- If the detector must remain outside of a restricted-access site, a tomographic analysis procedure can be applied to indicate source spatial distribution from the perimeter of the site.

These technologies and techniques could be deployed from any mobile survey platform and could aid in discriminating radiation due to nuclear weapons testing from that due to innocuous industrial activities.

Results

Point Sources

● two 185 MBq point Cs-137 sources

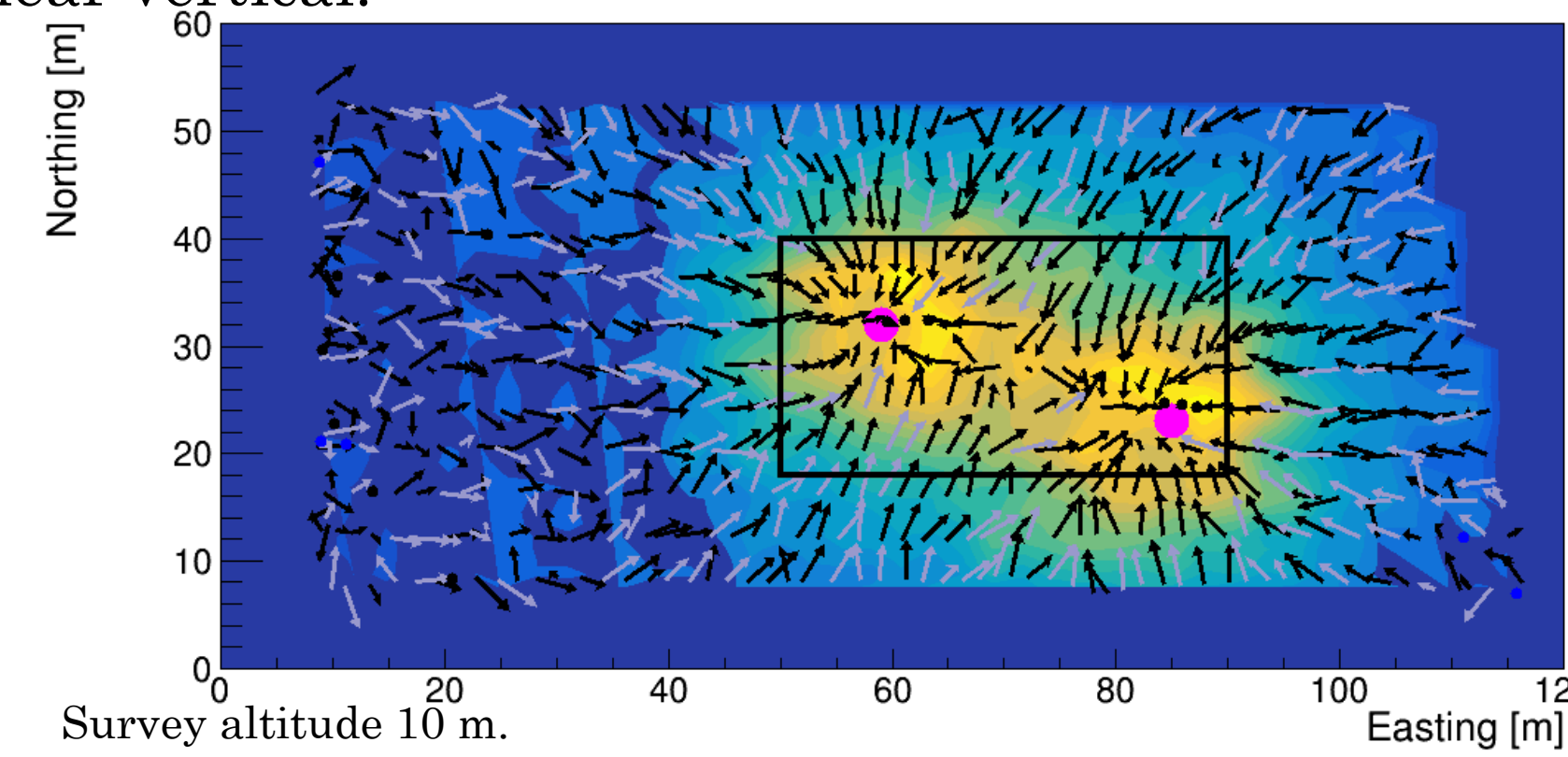
With overflight:

Cold Hot

→ Radiation direction (skyward)

→ Radiation direction (downward)

Arrows are projected into horizontal plane so appear shorter when near vertical.

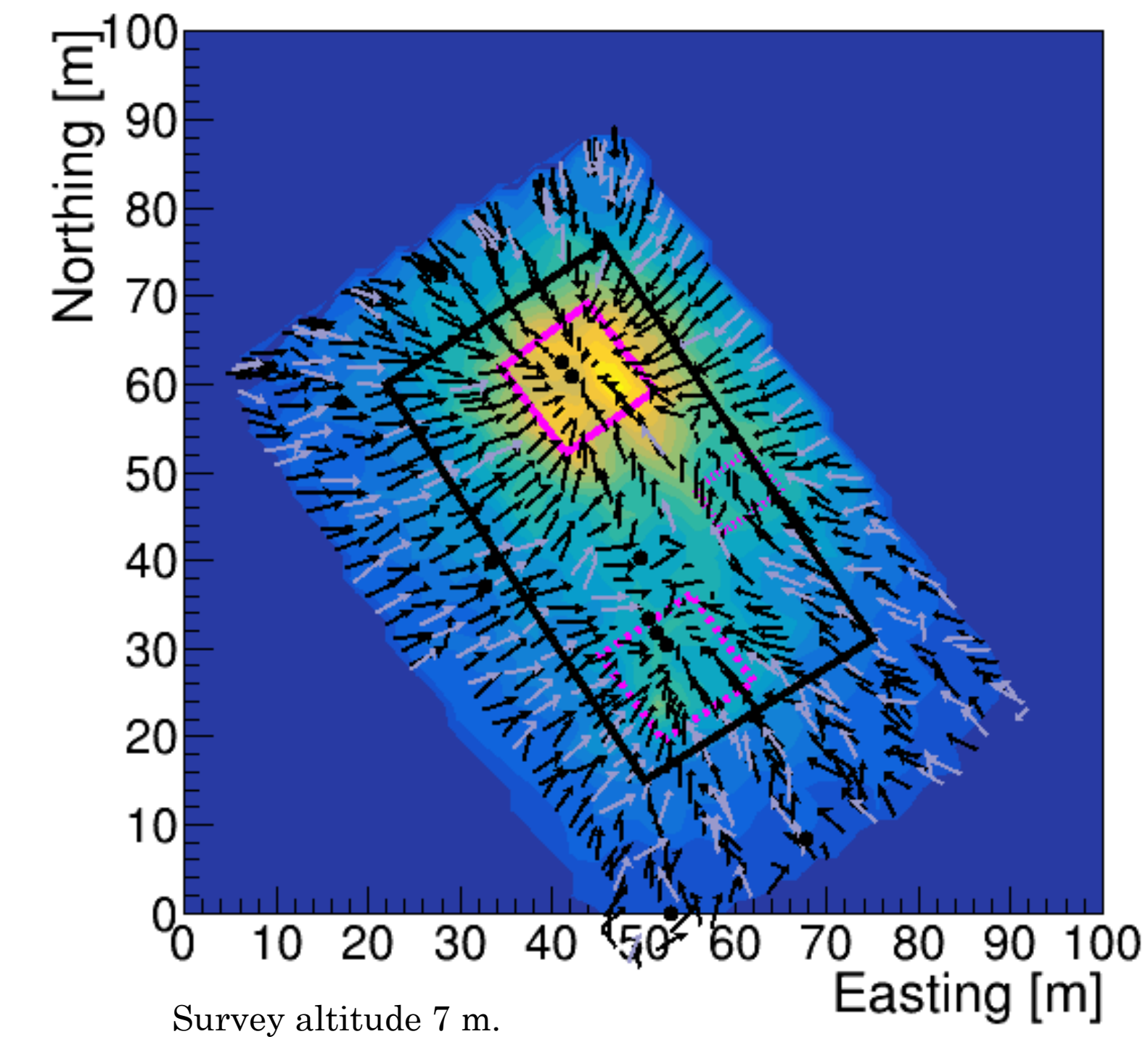


Medium-scale Dispersion

□ 136 MBq La-140 dispersed source

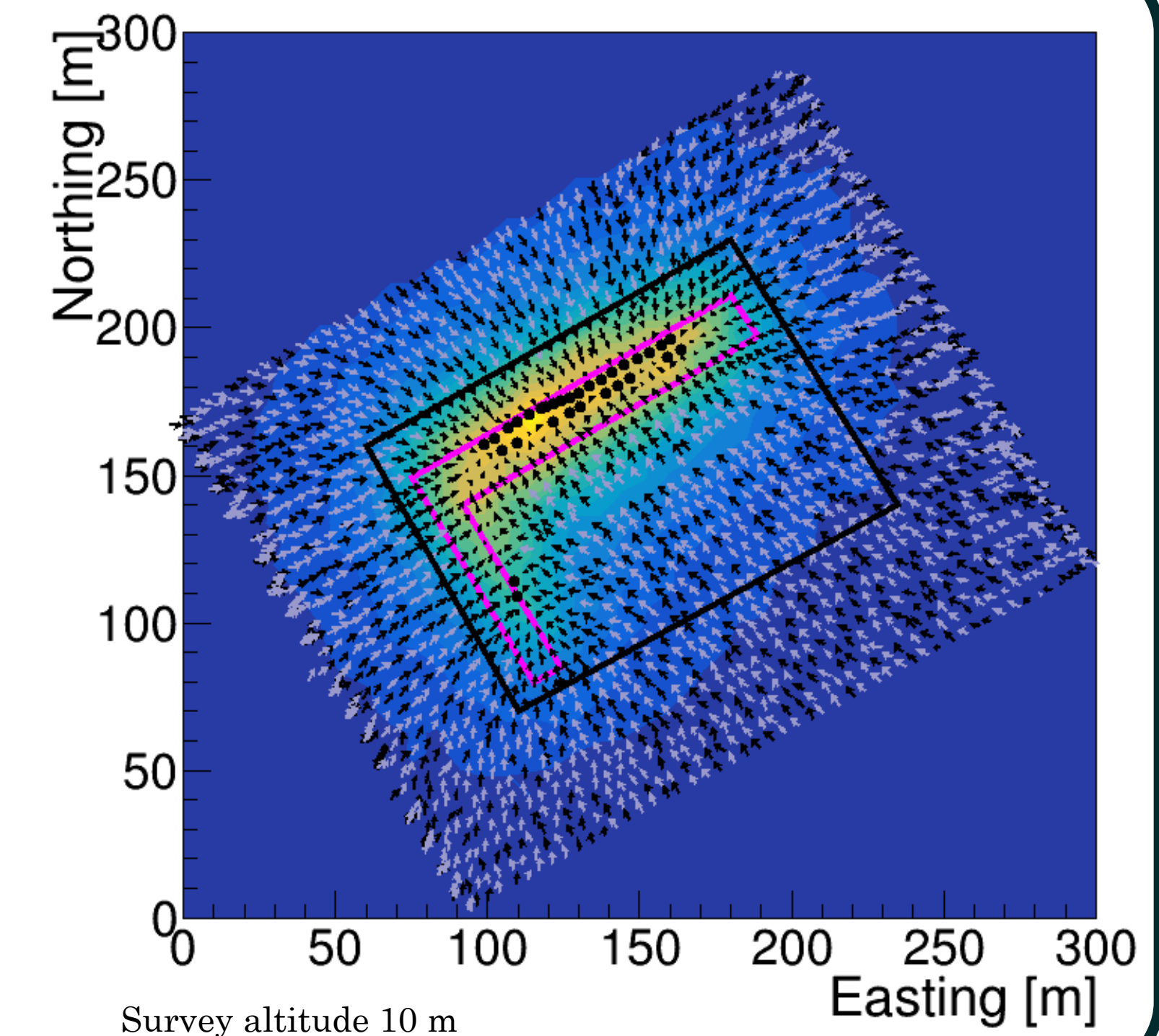
□ 45 MBq La-140 dispersed source

□ contaminated equipment



Large-scale Dispersion

□ 35 GBq La-140 dispersed source (primarily on long arm of L-shape)



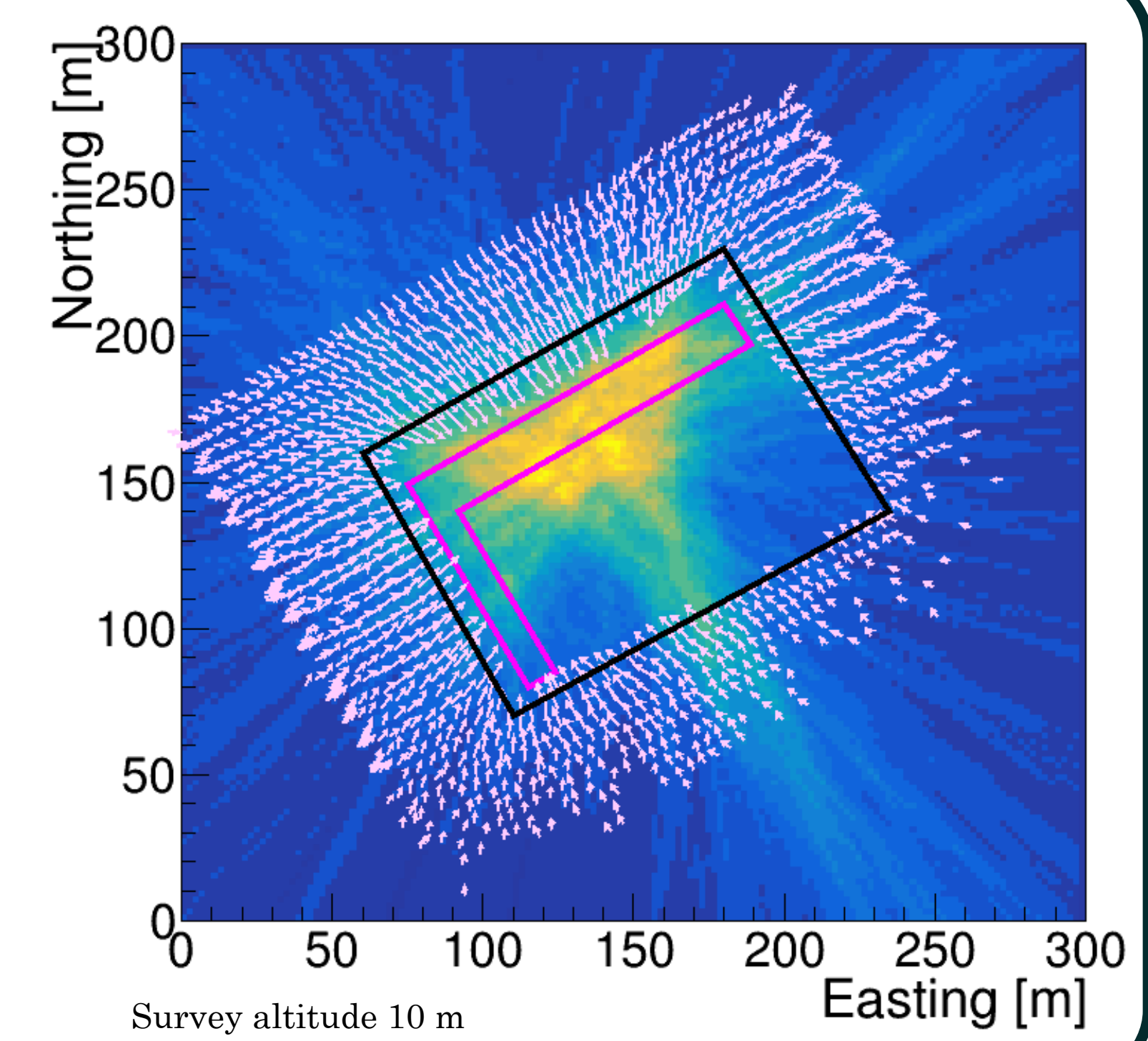
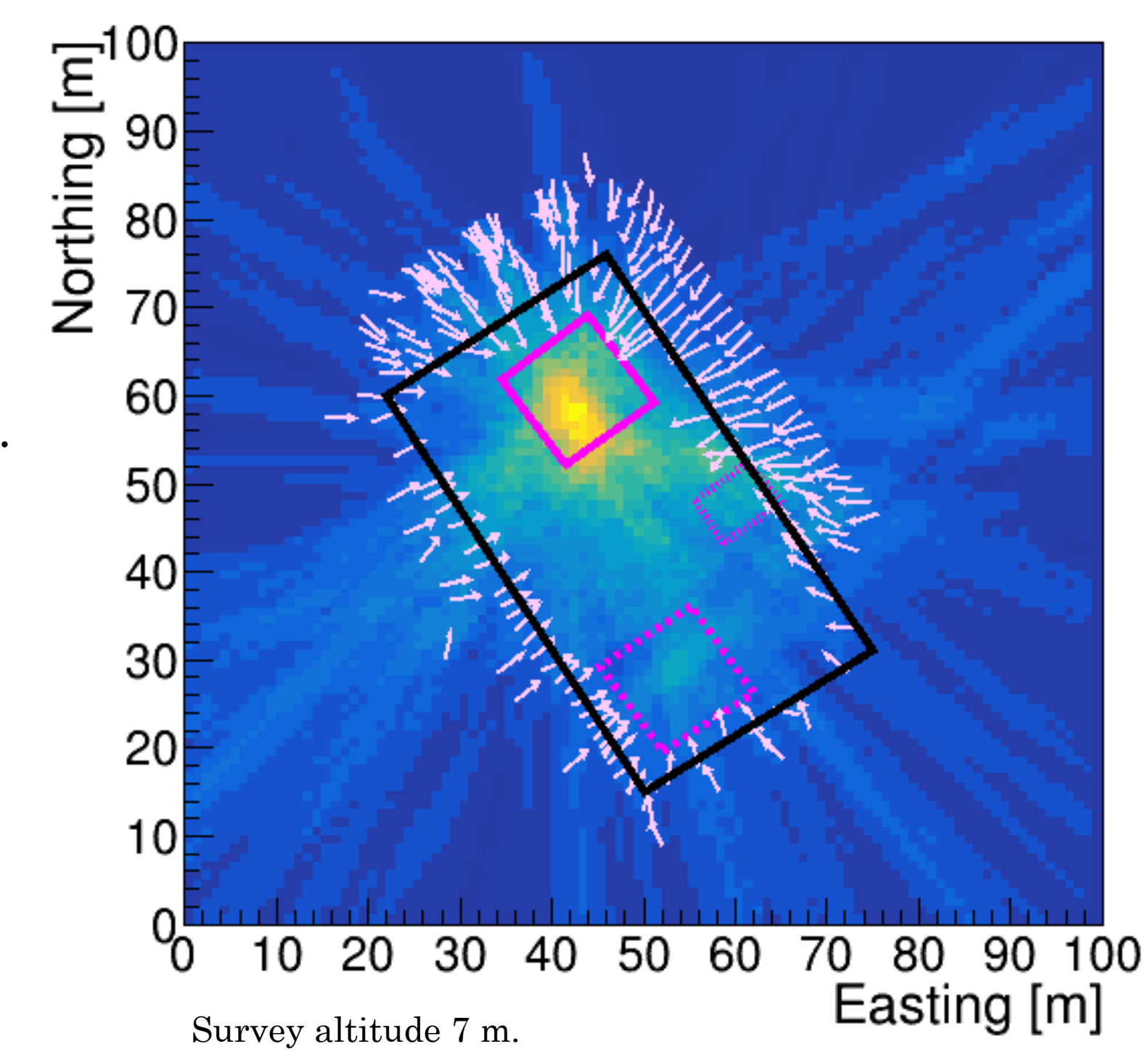
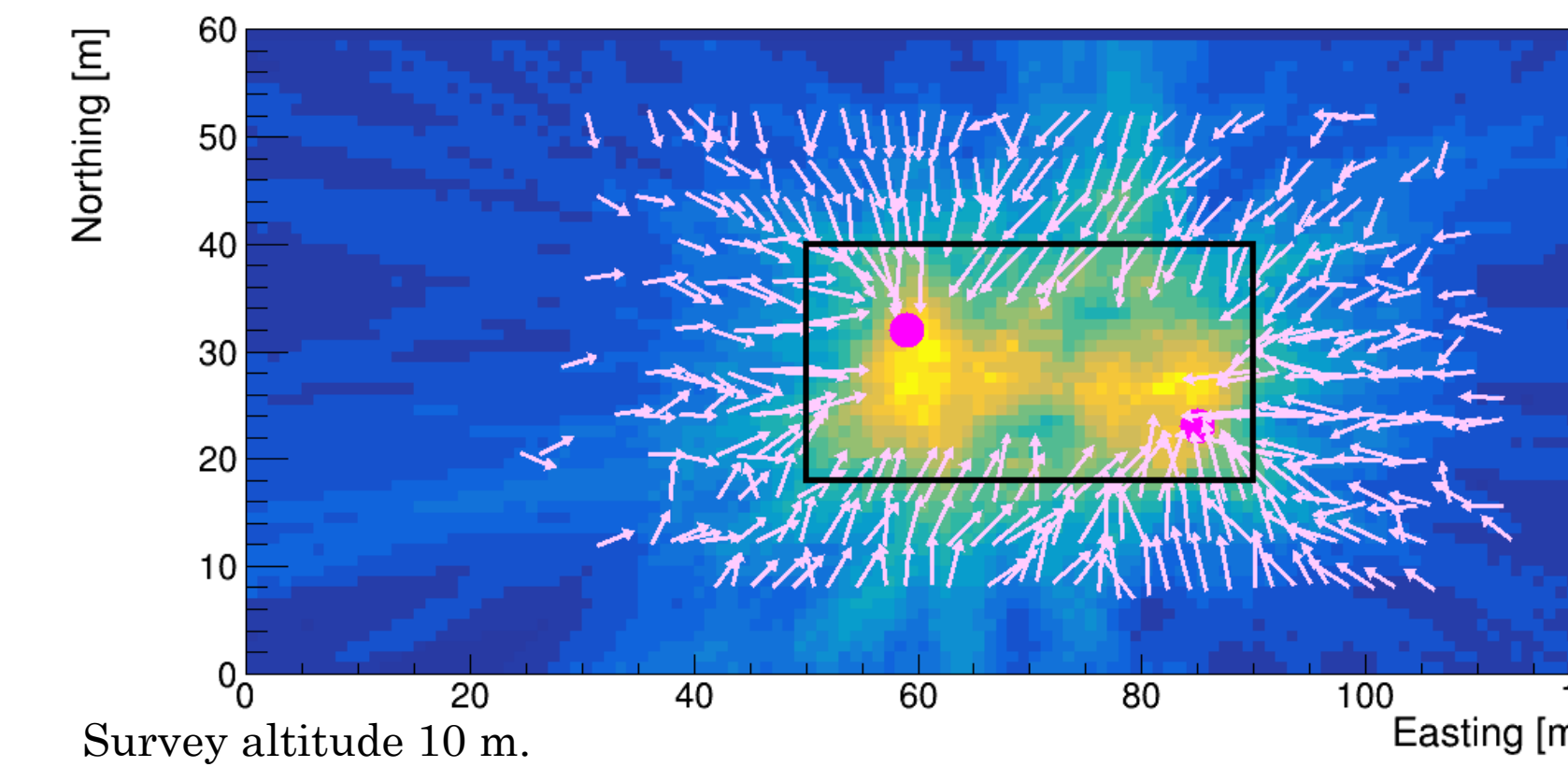
Perimeter survey - no overflight:

Cold Hot

→ Radiation direction

□ Perimeter of restricted access site

Length of arrow represents the significance of the measurement.



Bibliography

C.M.Chen, L.E.Sinclair, R.Fortin, M.Coyle, C.Samson, "In-flight performance of the Advanced Radiation Detector for UAV Operations (ARDUO)", Nuclear Instruments and Methods in Physics Research Section A, In Press, Available online 26 November 2018.

Acknowledgements

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