ADDAM and CSA-ERM Modelling Approach and Results for the Mid-Range Scenario

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Features &Capabilities of ADDAM & CSA-ERM codes, and their comparison

- Features and capabilities were introduced to this Working Group (WG) in January 2010
- Comparison was shown to this WG on Jan 25, 2011, the results were produced by CSA-ERM, some were verified with ADDAM

Application of the model to the mid-range scenario

- CSA-ERM cannot handle spatial wind vectors, those were summed outside the code
- It has options for making either conservative or realistic predictions; realistic options and parameter values were used in these calculations
- The threshold wind speed for switching from the “short term model” (where prediction can be made at any X and Y location) to the “prolonged term model” (where prediction can only be made on the plume centerline sector and concentrations in all other sectors become zero) was lowered from 2 m/s to 0 m/s.

Adapting the data in the scenario description to the model

- Cs-137 halflife ~ 30.17 years; I-131 halflife ~ 8.04 days
- Cs-137 => Ba-137m (daughter reaches equilibrium with parent), not considered
- I-131 => Xe-131m (daughter never build close to parent), not considered
- Cs-137: 6.43e11 Bq released in one hour
- I-131: 3.69e12 Bq released in one hour

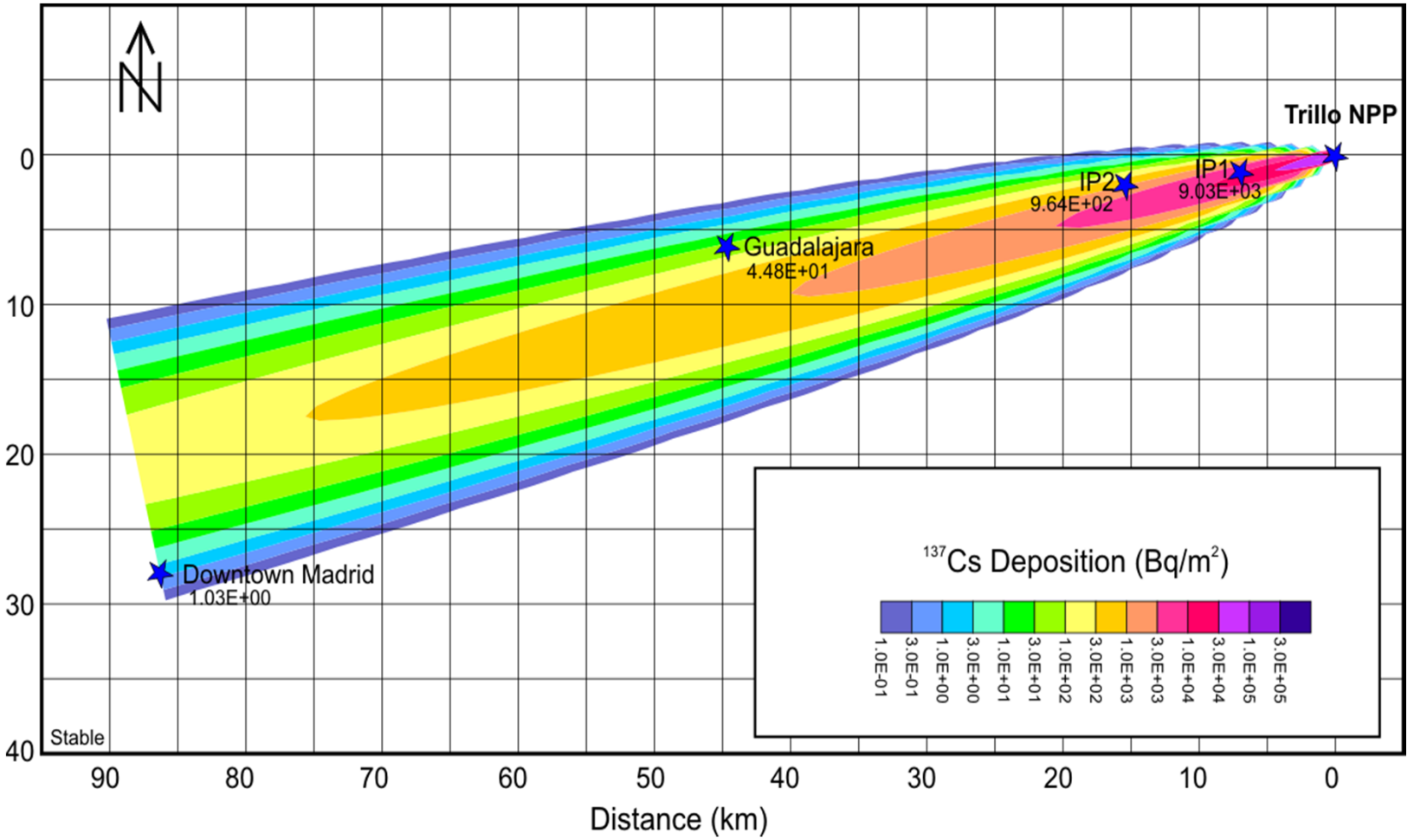
Assumptions made to match the model to the scenario

- Air temperature: 20 Degree
- No rain, no fog
- Wind speed: 1.78 m/s for Stable; and 3.16 m/s for Neutral situations
- Stability class: E for stable conditions; and D for neutral conditions
- Dry deposition velocity: best estimate; 0.01 m/s for Cs-137; 0.008 m/s for I-131; for grass surface

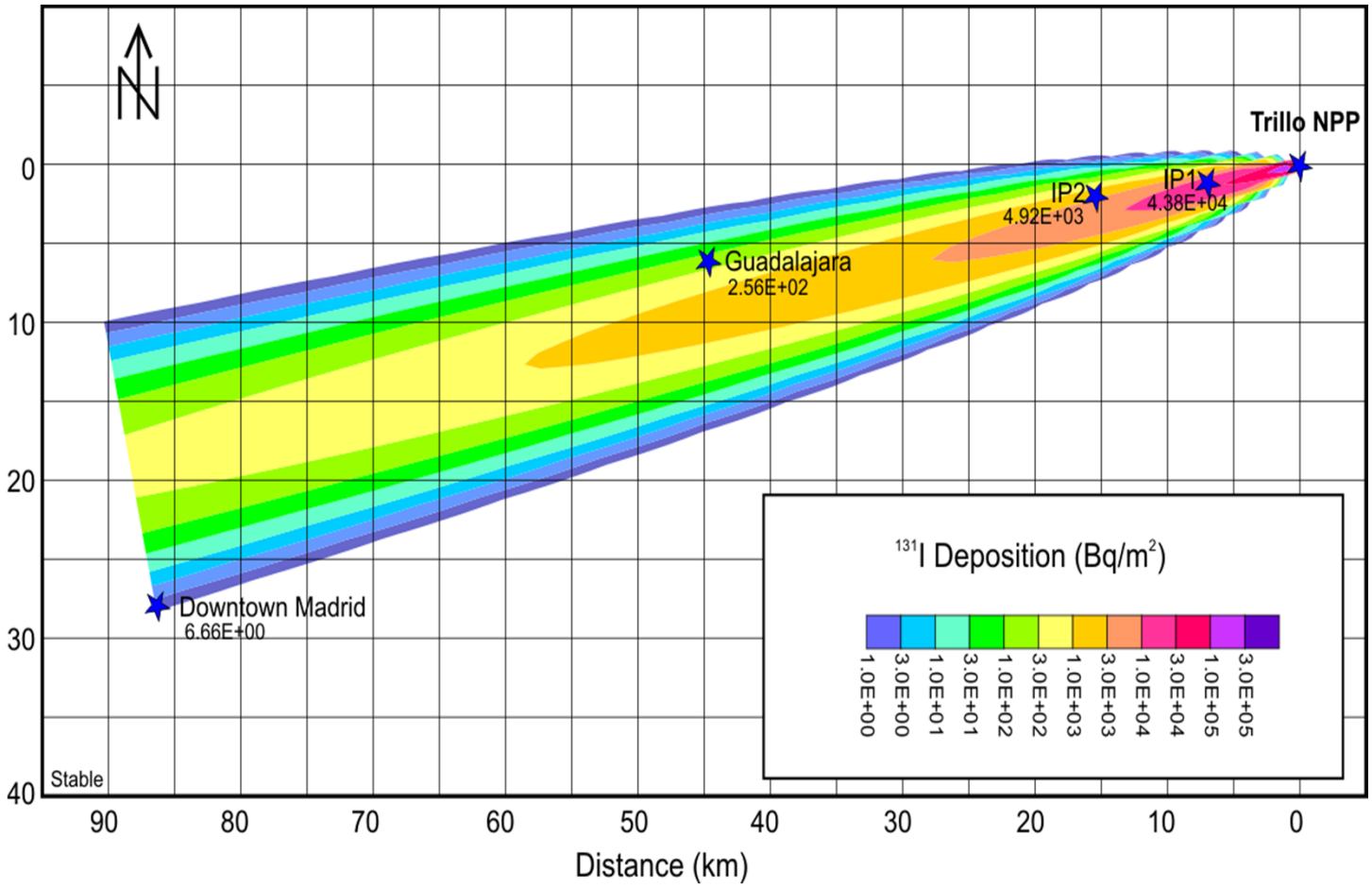
Specific parameter values used for the scenario

- Effective release height: 50 m; stack; downwash, plume rise, entrainment and building wake effect not applied
- Σ_y and Σ_z from stability class; short term dilution factor model used
- Building constant C_b: 1
- Inversion layer height: 1000 m for Stable; 1500 m for Neutral situations
- Terrain cover: grass; roughness length: 0.4 m
- Receptor height: 0 m

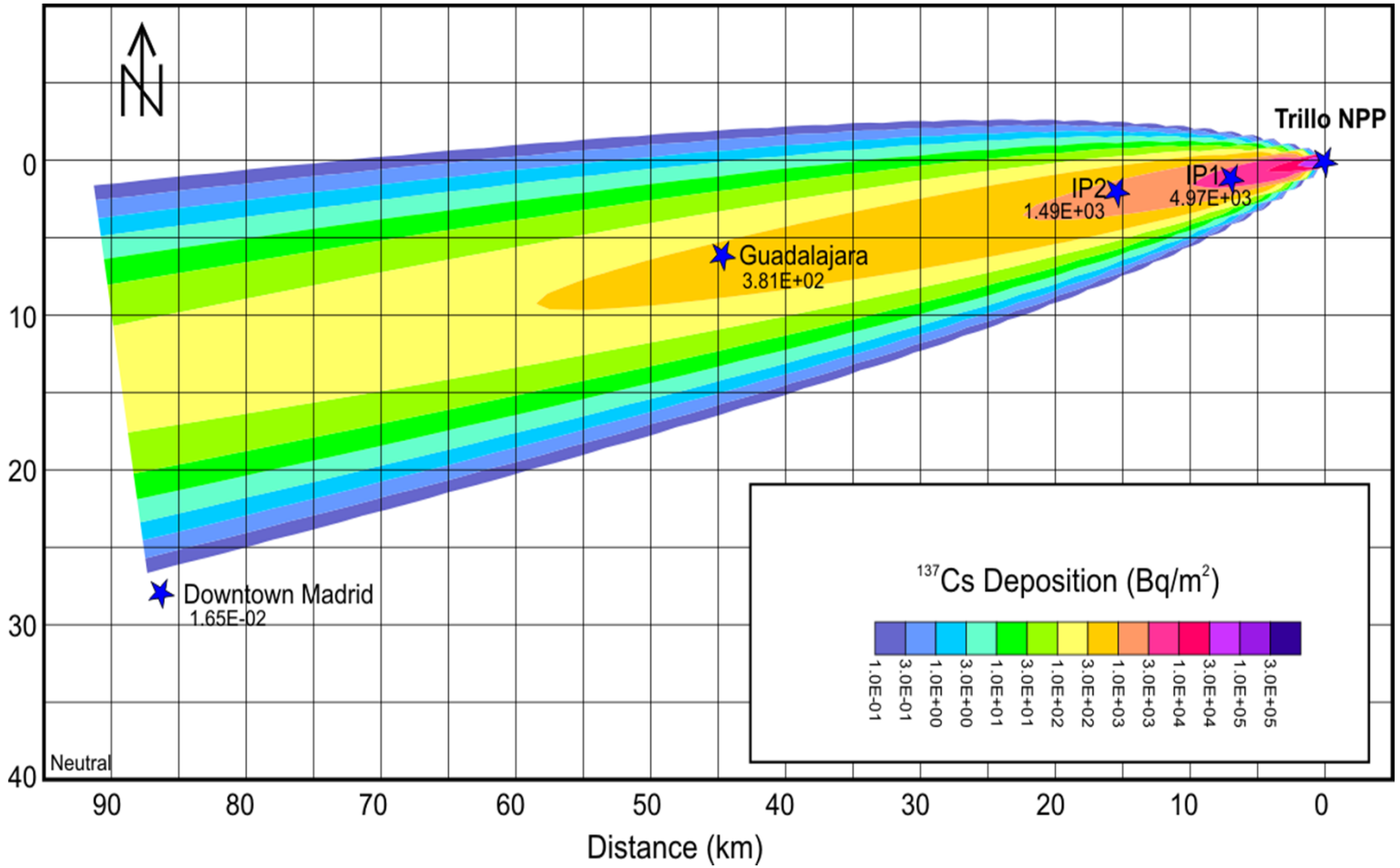
Results: Deposited activity on the ground at the end of the simulation for Cs-137 release during stable met conditions



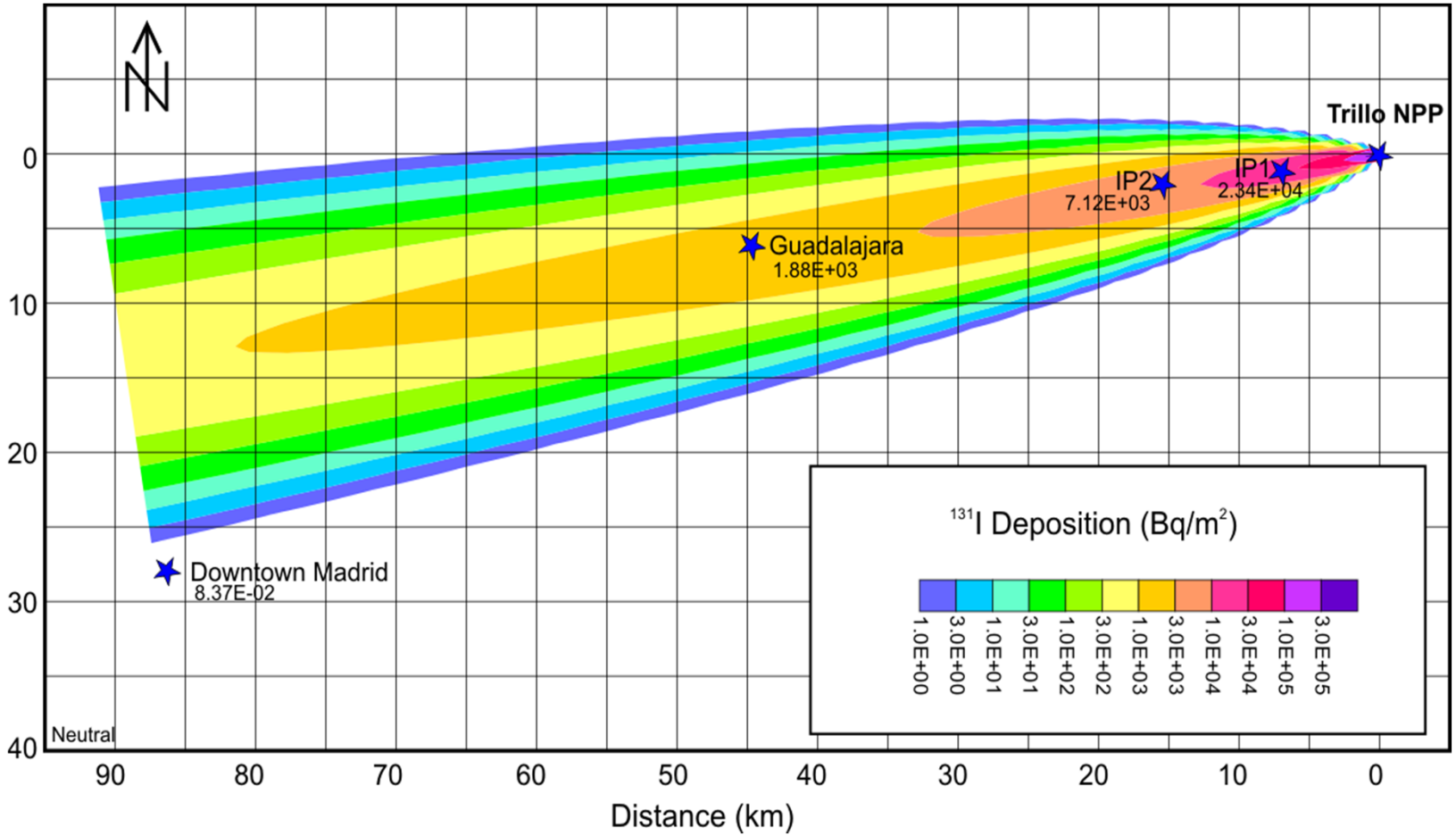
Results (continued): Deposited activity on the ground for I-131 release during stable met conditions



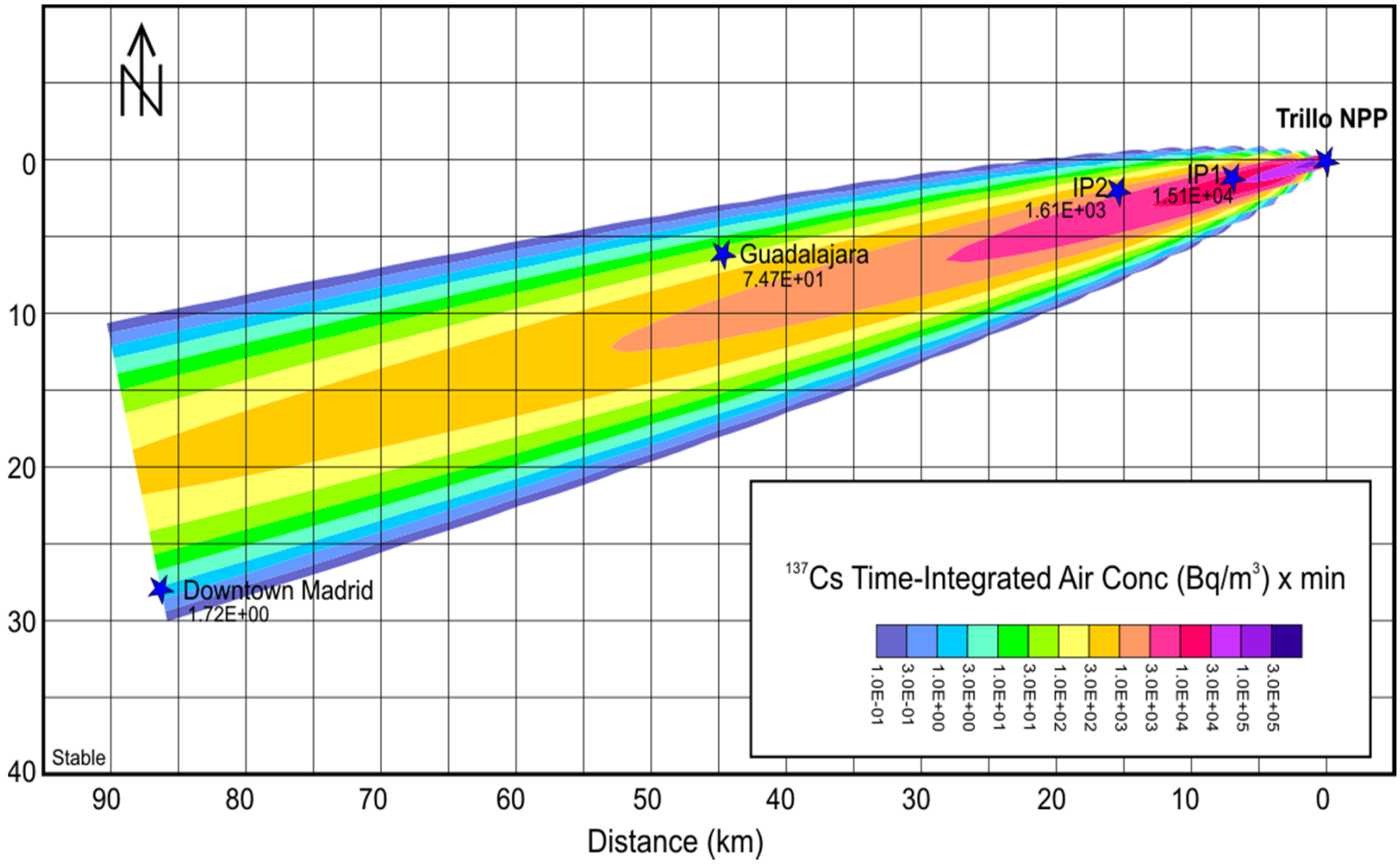
Results (continued): Deposited activity on the ground for Cs-137 release during neutral met conditions



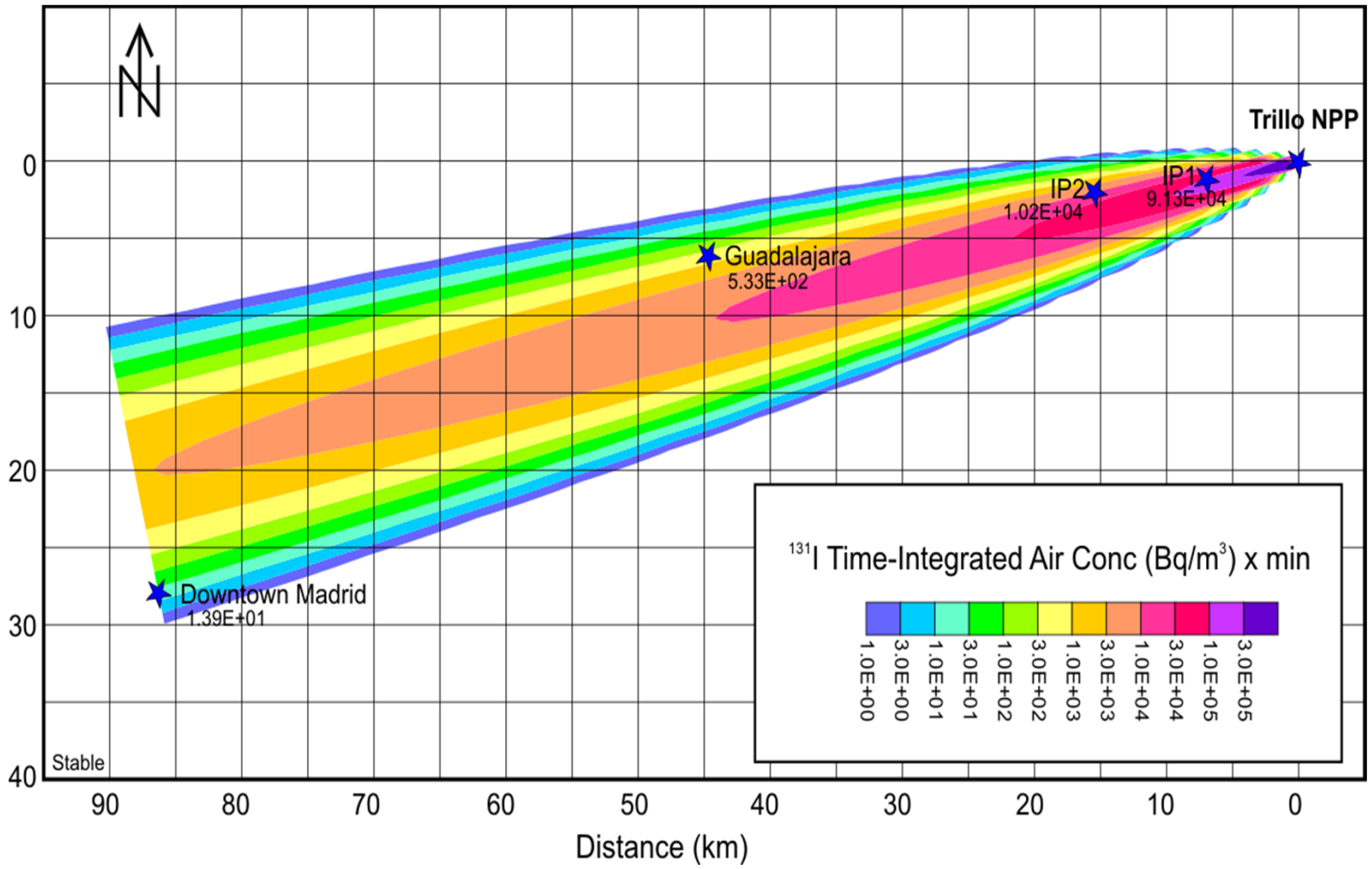
Results (continued): Deposited activity on the ground for I-131 release during neutral met conditions



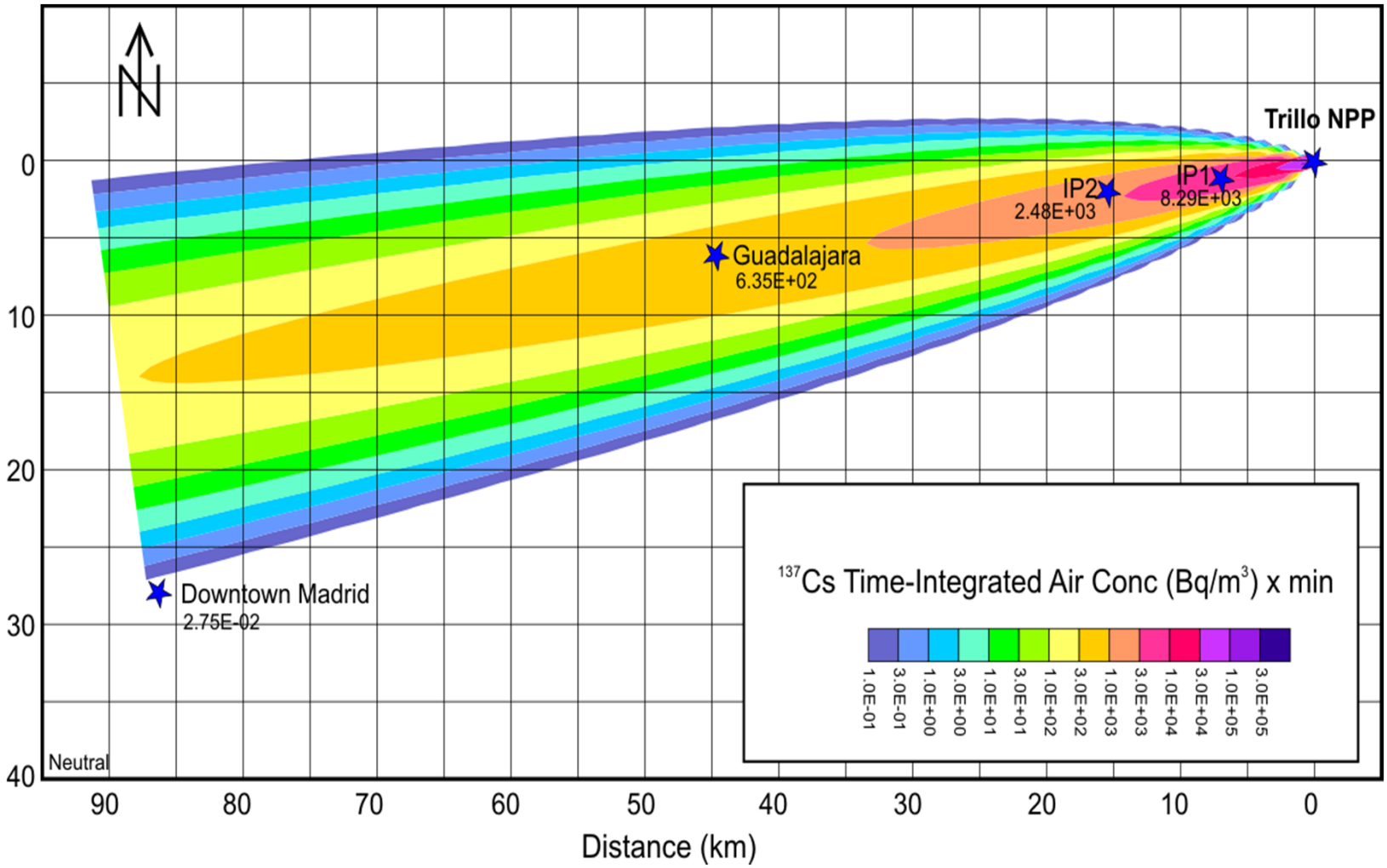
Results (continued): Time integrated air activity concentration at ground level for Cs-137 release during stable met conditions



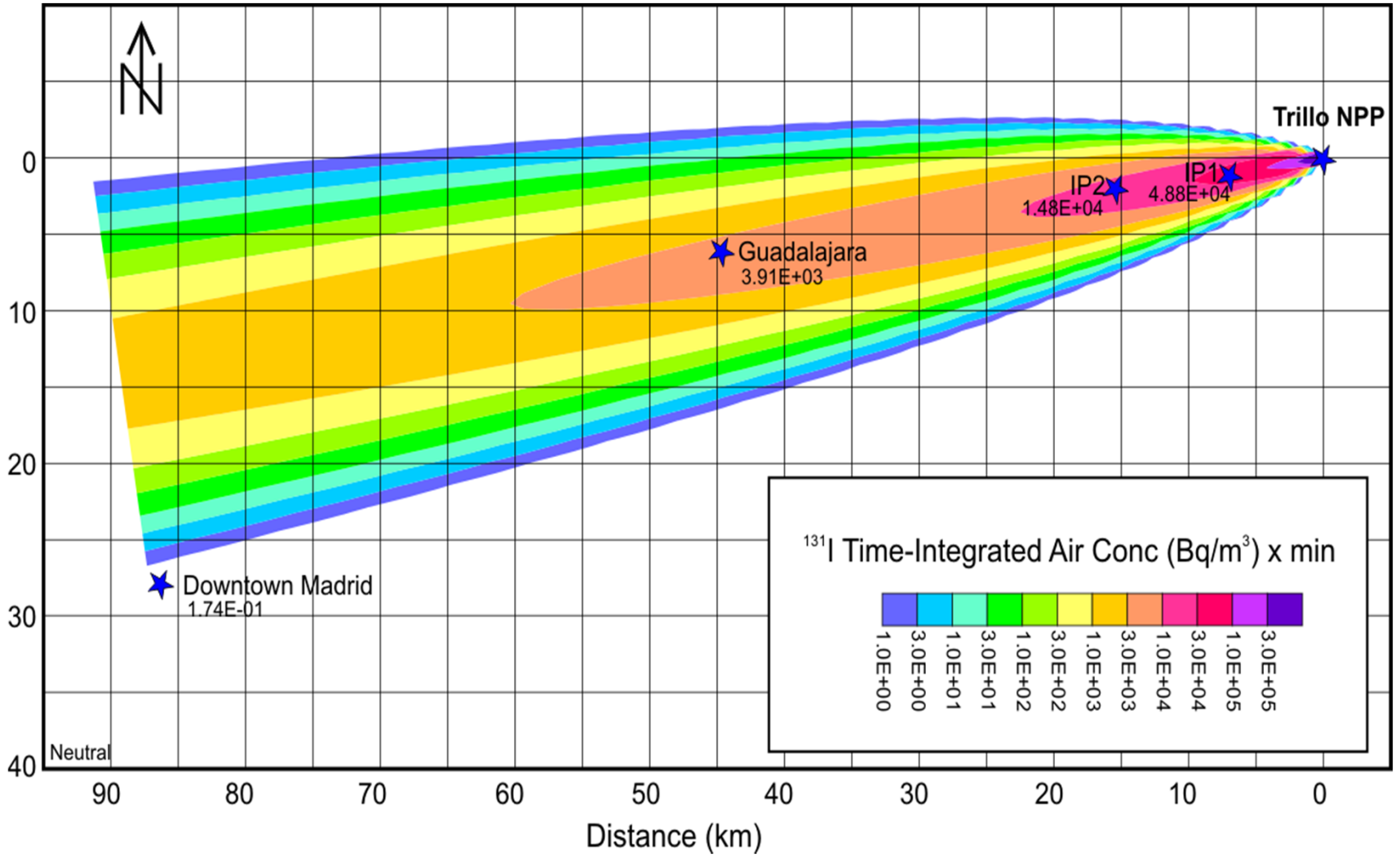
Results (continued): Time integrated air activity concentration at ground level for I-131 release during stable met conditions



Results (continued): Time integrated air activity concentration at ground level for Cs-137 release during neutral met conditions



Results (continued): Time integrated air activity concentration at ground level for I-131 release during neutral met conditions



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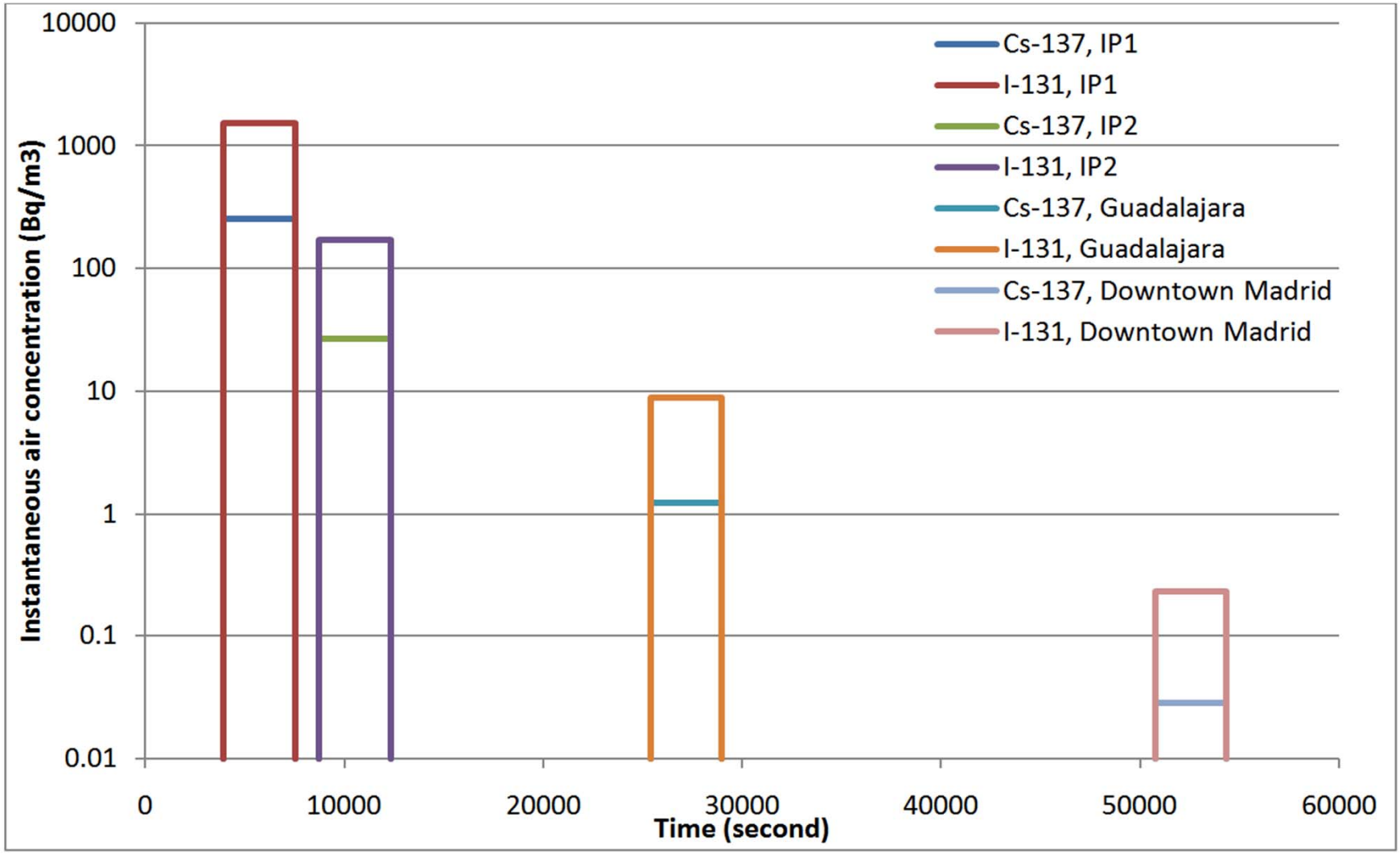
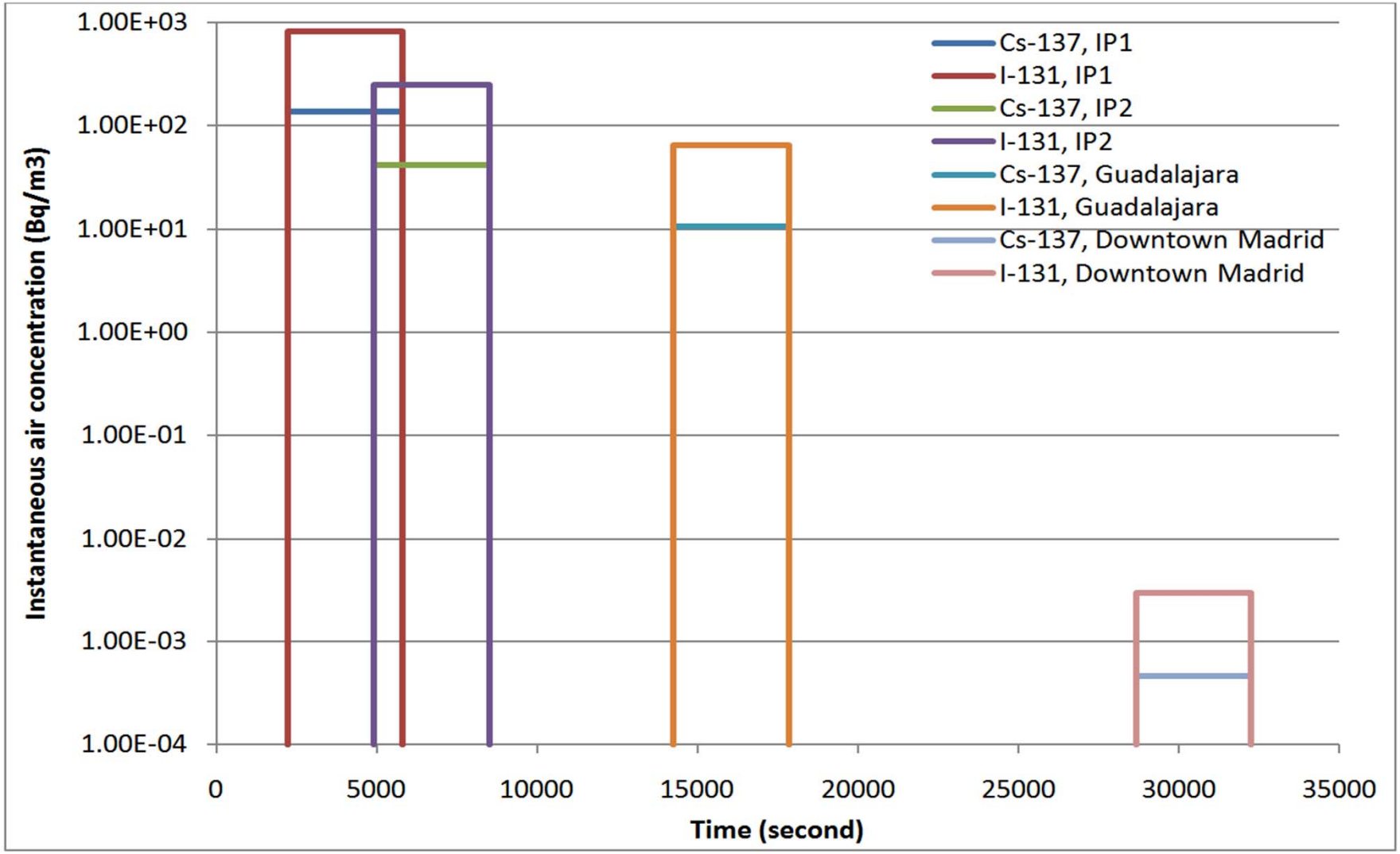
Results (continued): Time Series of activity concentration in air for release during stable met conditions



Results (continued): Time Series of activity concentration in air for release during neutral met conditions



Results (continued)

- More detailed results were provided to the WG leader for comparison

Acknowledgments to current ADDAM development and meteorological data collection team:

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B. Reavie

P. Leeson

The help from D. Killey in creating the plume contours is also much appreciated.


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