LOW WIND TREATMENT IN AERMOD NEAR-SURFACE RELEASES

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meander factor) were added. Please comment on your experience with the ADJ_U* option in modeling situations involving light wind, stable conditions.

Please also comment on the EPA's strategy and the benefits for providing LOW_WIND components as ALPHA options for testing and evaluation purposes. If applicable, share your

Do you have additional recommendations for further adjustments or options to address potential overpredict biases in the model during light wind, stable conditions? For example, model

For assessing model performance during light wind, stable conditions periods, are the existing databases adequate for investigating further model improvements? Are there additional or

MOTIVATION FOR ADJUSTMENT

AERMOD overestimates concentrations when the winds are low especially under stable conditions

Solutions

1. Ensure that u_* does not approach zero when wind speed does
2. Set minimum values for U and σ_v
3. Introduce meandering

FRICTION VELOCITY ADJUSTMENT

QIAN AND VENKATRAM (2011)

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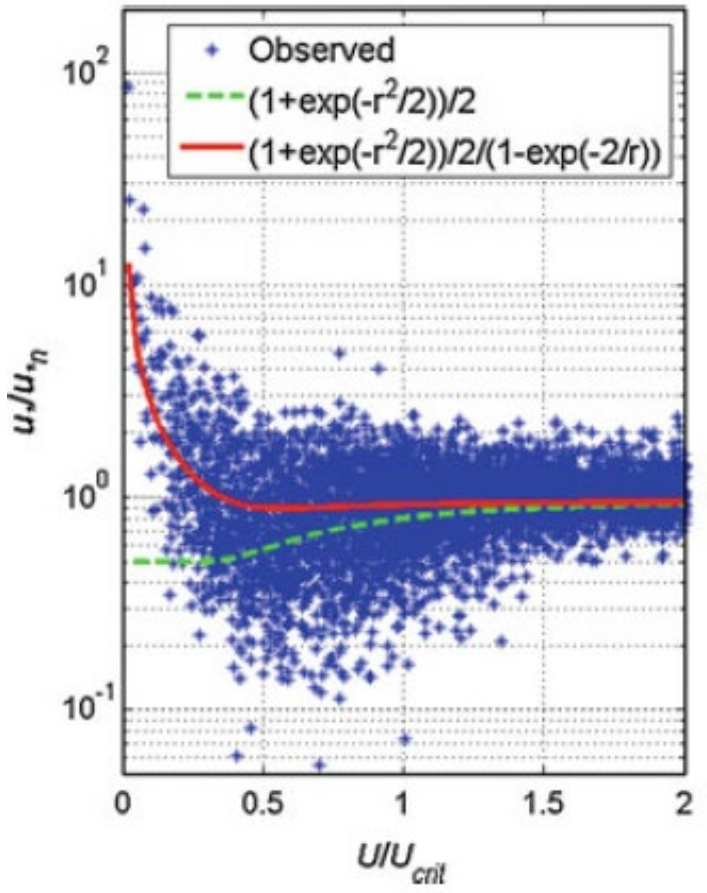


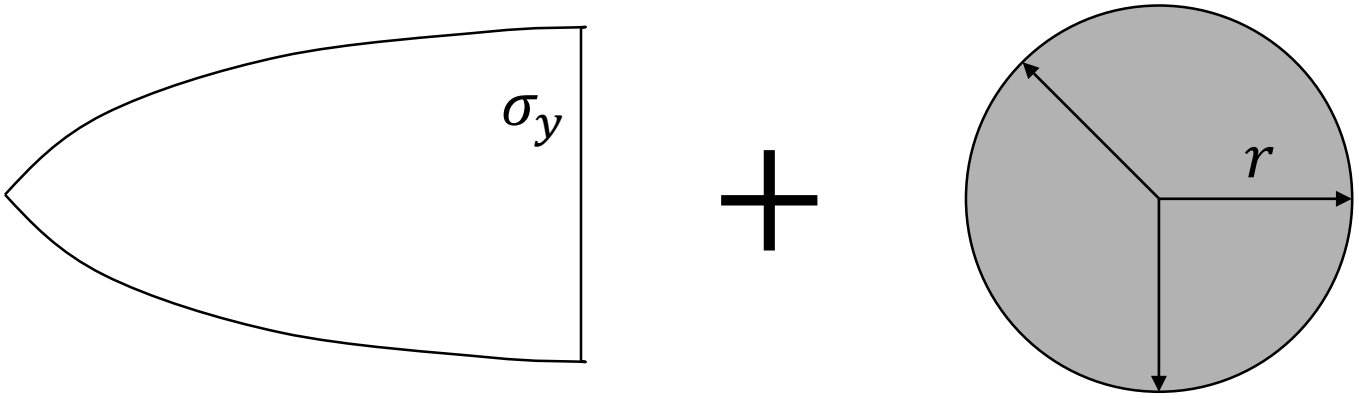
$$u_* = \frac{C_{DN}^{1/2} U}{2} \frac{1 + \exp\left(-r^2/2\right)}{1 - \exp(-2/r)}.$$

$$r = \frac{U_{crit}}{U}$$

$$U_{crit} = \frac{2u_0}{C_{DN}^{1/4}}$$

$$u_0 = \left(\frac{\beta g \left(z_r - d_h - z_0\right) T_*}{T_0} \right)^{1/2}.$$

Meandering



Plume Pancake

$$C = \overline{C}^{y}\left[\frac{(1-f_r)}{\sqrt{2\pi}\sigma_y} + \frac{f_r}{2\pi r}\right]$$

Weighting Factor

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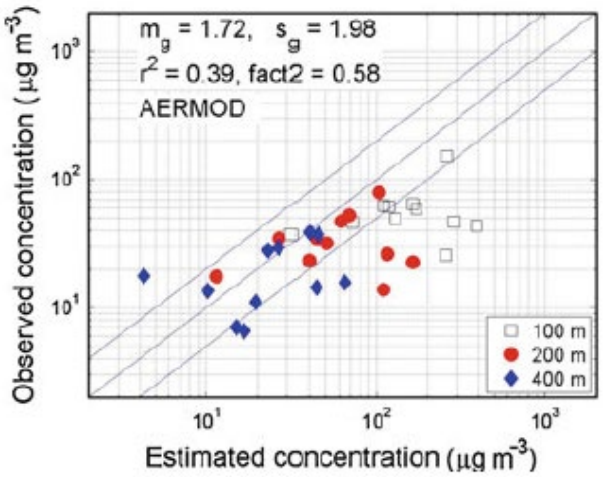
$$f_r = \frac{2\sigma_v^2}{U_{eff}^2}$$

$$U_{eff} = \left(U^2 + 2\sigma_v^2\right)^{1/2}$$

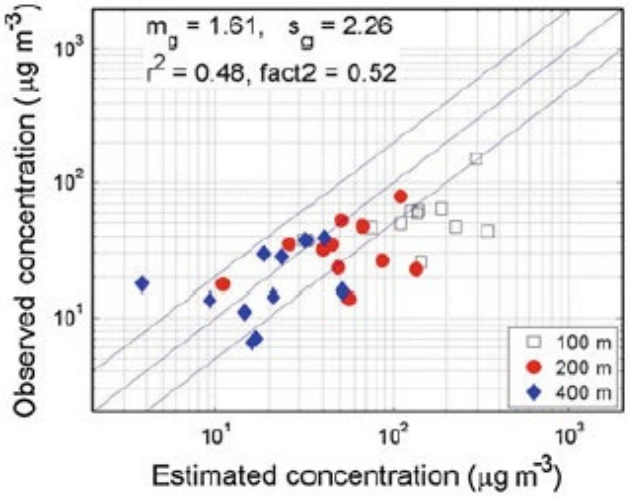
Problem: Need to measure or estimate σ_v

$$\sigma_v^2 = \left(2.5u_*\right)^2 + \left(0.6w_*\right)^2$$

Results from Model Applied to Idaho Falls Data

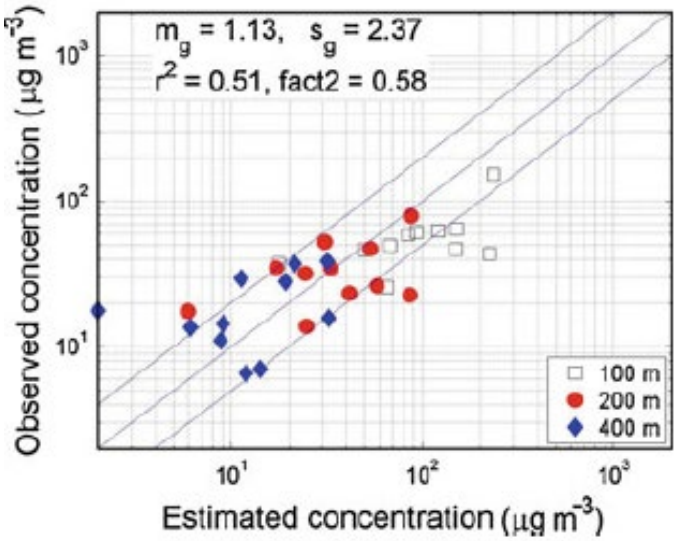


Concentrations over-predicted with meandering

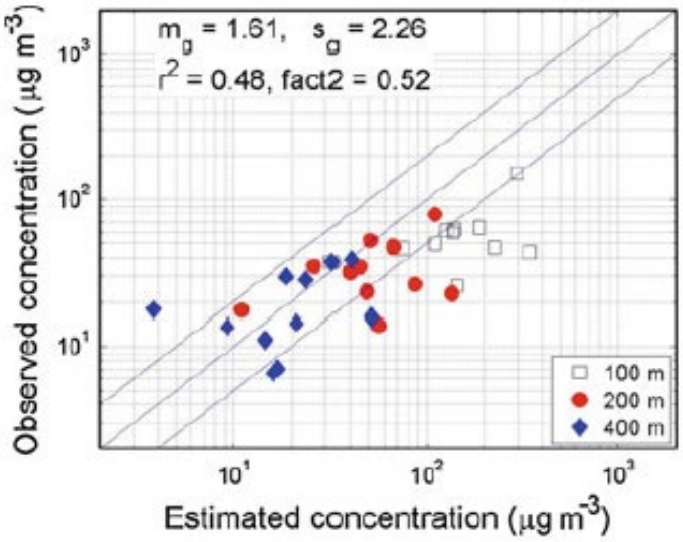


Concentrations without meandering in numerical model with better vertical dispersion

Results from Model



Concentrations with meandering in numerical model



Concentrations without meandering in numerical model with better vertical dispersion model

Dispersion in Urban Areas

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ELSEVIER

Atmospheric Environment 38 (2004) 4633–4641

ATMOSPHERIC ENVIRONMENT

www.elsevier.com/locate/atmosenv

Modeling dispersion at distances of meters from urban sources

Akula Venkatram[a,*], Vlad Isakov[b], Jing Yuan[a], David Pankratz[a]

(a)

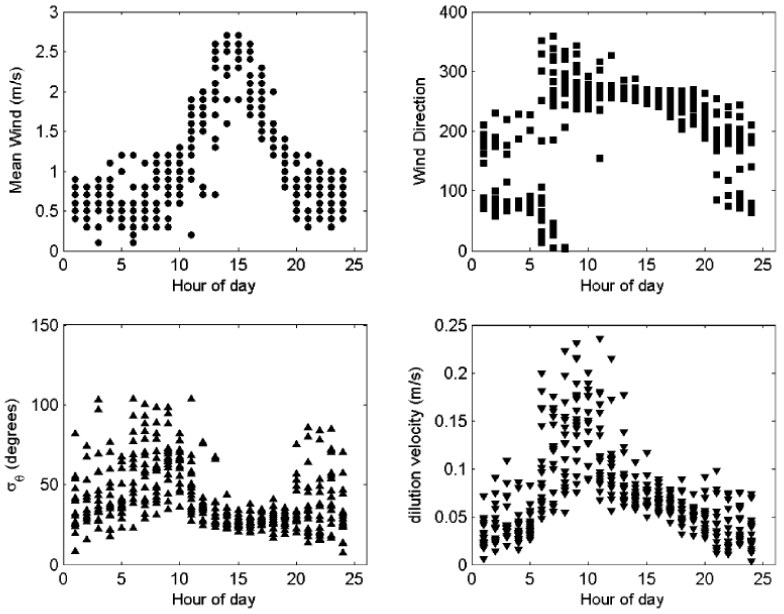
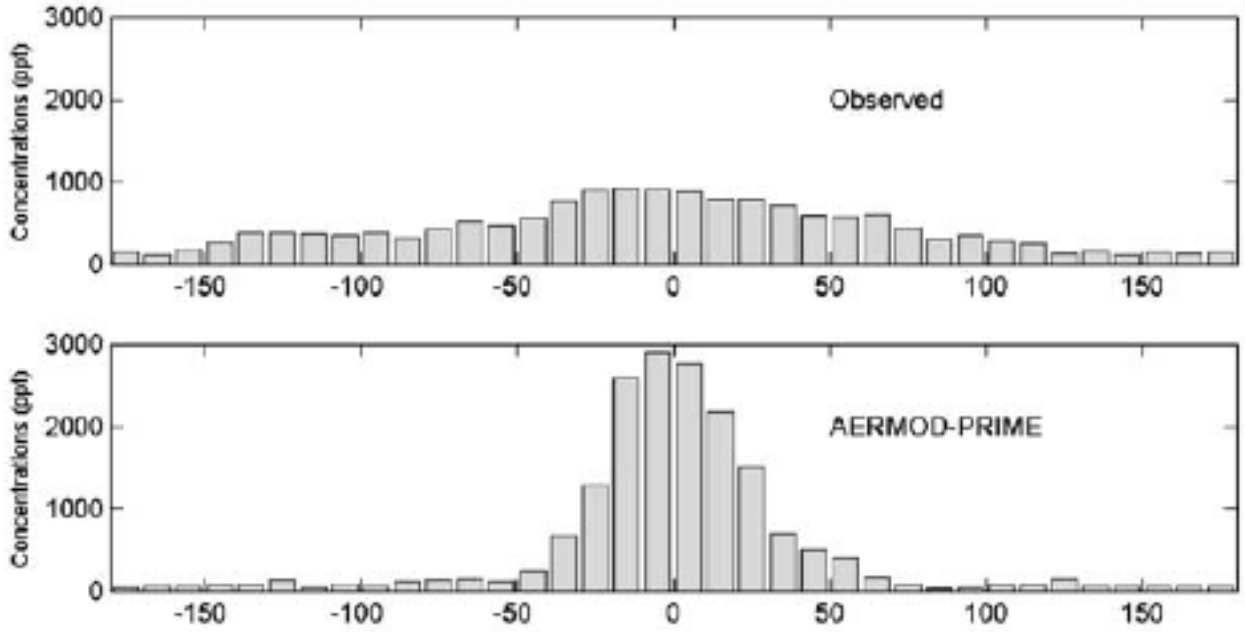


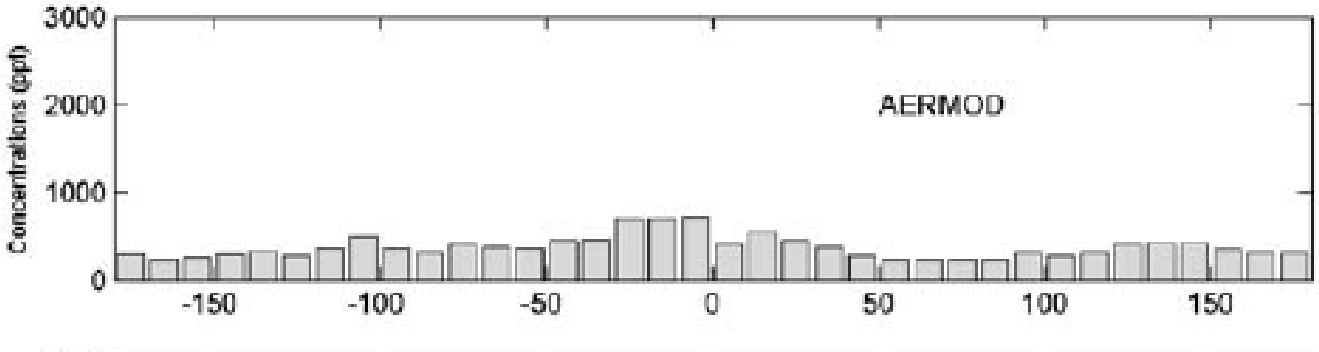
Fig. 2. Variation of dispersion parameters during experiment.

$$C_{\max} \sim \frac{Q}{\sigma_\theta \sigma_w r^2} = \frac{Q}{u_{\mathrm{dil}} r^2}.$$

Modeling Results



With Meandering



Conclusions

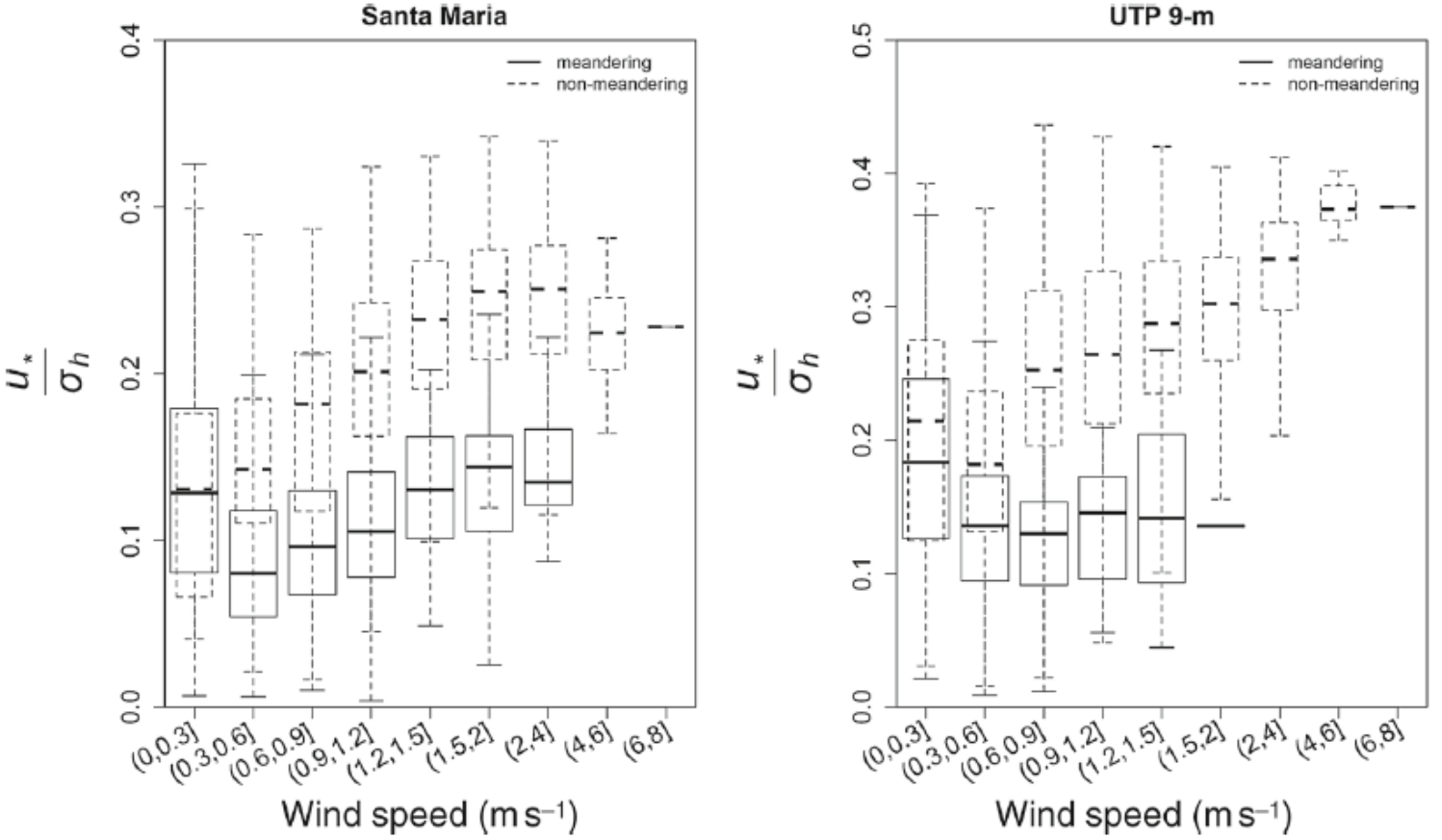
Estimating concentrations at low wind speeds needs

- Adjusting micromet variables-u_* and σ_v
- Horizontal meandering
  - Reformulate as a function of wind speed
- Vertical meandering ?

Characterization of Wind Meandering in Low-Wind-Speed Conditions

Luca Mortarini[1] · Michel Stefanello[2] · Gervasio Degrazia[2] · Debora Roberti[2] · Silvia Trini Castelli[1] · Domenico Anfossi[1]

Boundary-Layer Meteorol (2016) 161:165–182
DOI 10.1007/s10546-016-0165-6



Potential Data Bases

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Project

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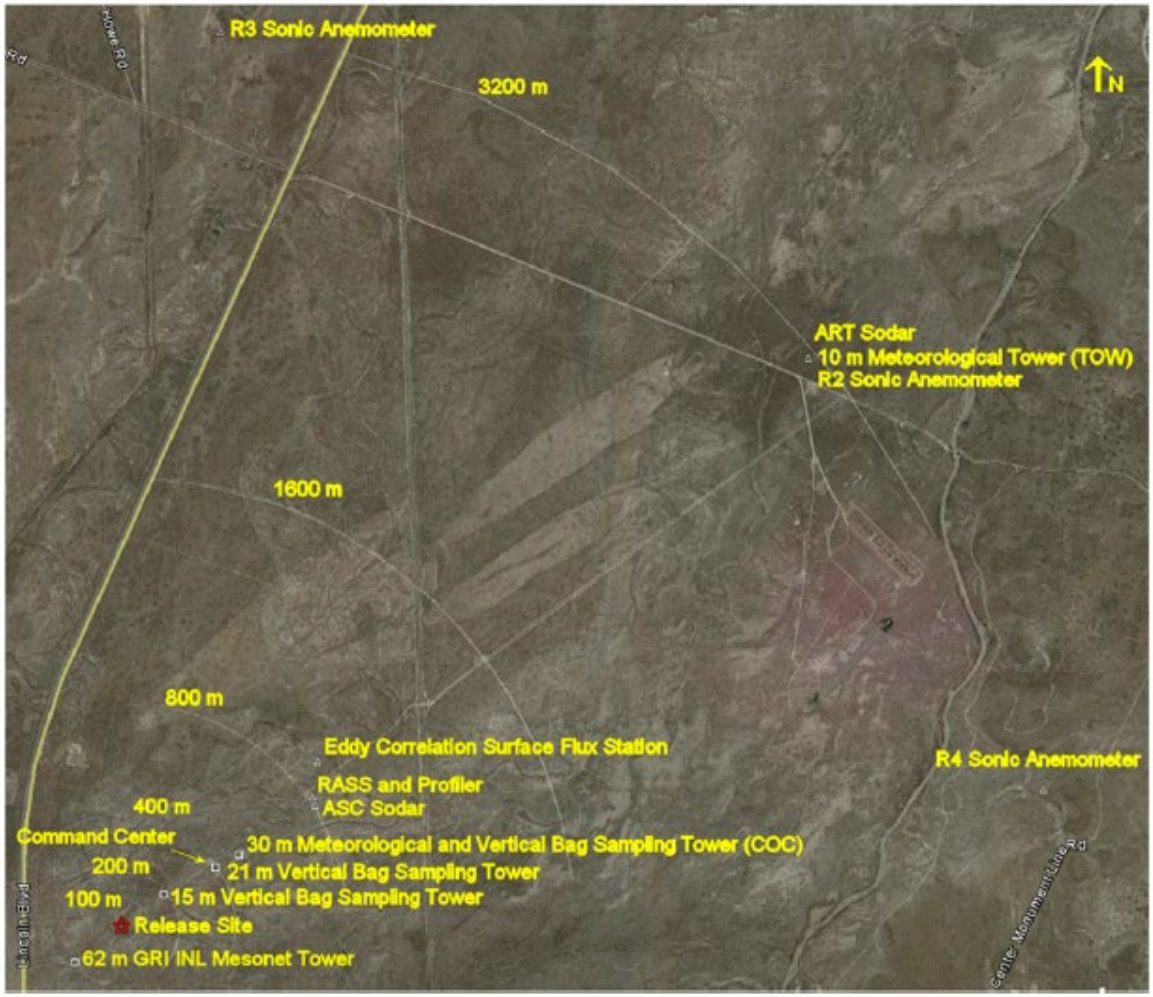

FIG. 1. Image of the experimental field site showing tracer bag-sampling arcs, northeastern axial road, and locations of some key sites (image is copyright by Google, Inc.).

Project Sagebrush-Meandering