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Supplemental Materials for "A Spatial Modelling Approach for the Blending and Error Characterization of Remotely Sensed Soil Moisture Products"

Grace S. Chiu
CSIRO Mathematics, Informatics and Statistics

Eric A. Lehmann
CSIRO Mathematics, Informatics and Statistics

Joshua C. Bowden
CSIRO Information Management and Technology

Abstract

NA

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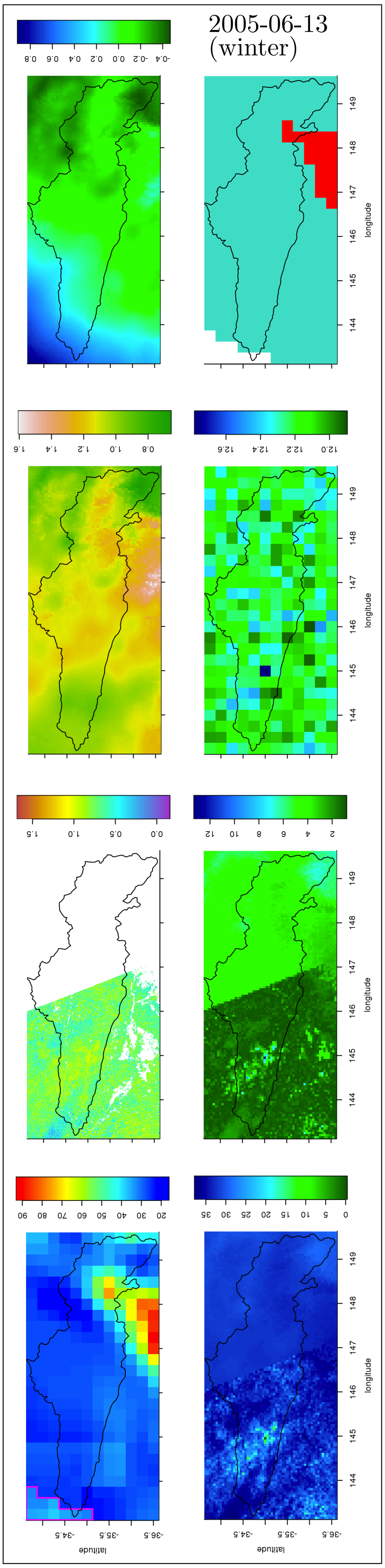
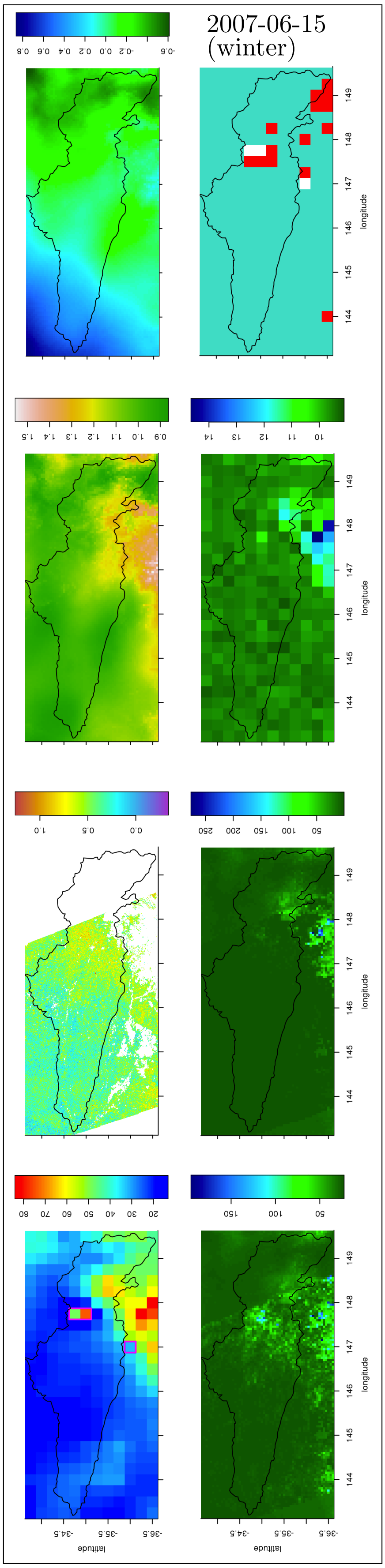
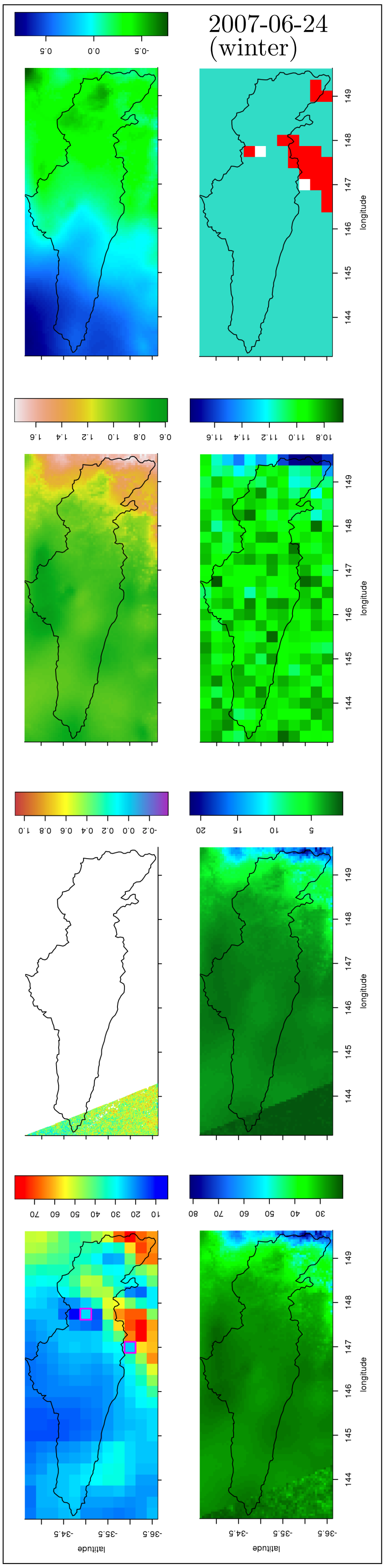
S1. Supplemental figures

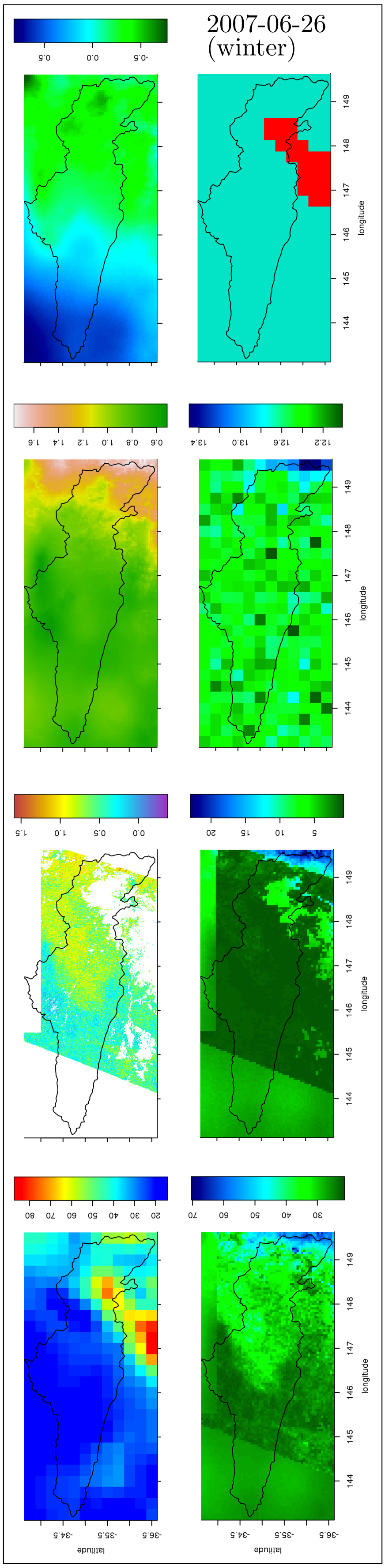
In the main text, inference maps based on our model in Section 3 for 2006-06-17 already appear in Figs. 3–4. Here, we provide the set of inference maps for each of the remaining seven dates, with the following legend:

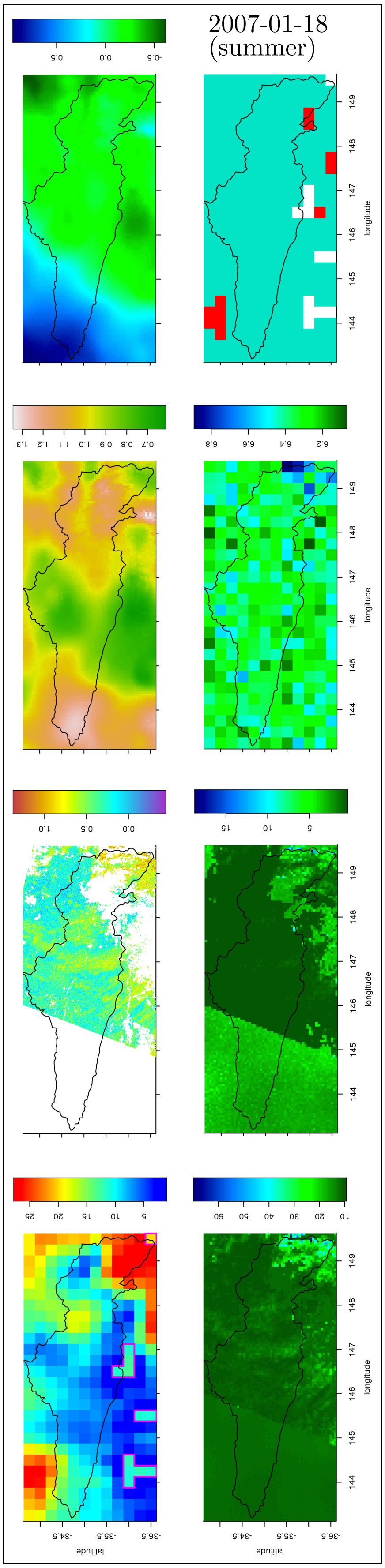
$v, \widehat{v}$	q	p	$\widehat{\phi}$	
$\widehat{\psi^s}$	SD(ψ^s|data)	SD(v^{pred}|data)	coverage	date

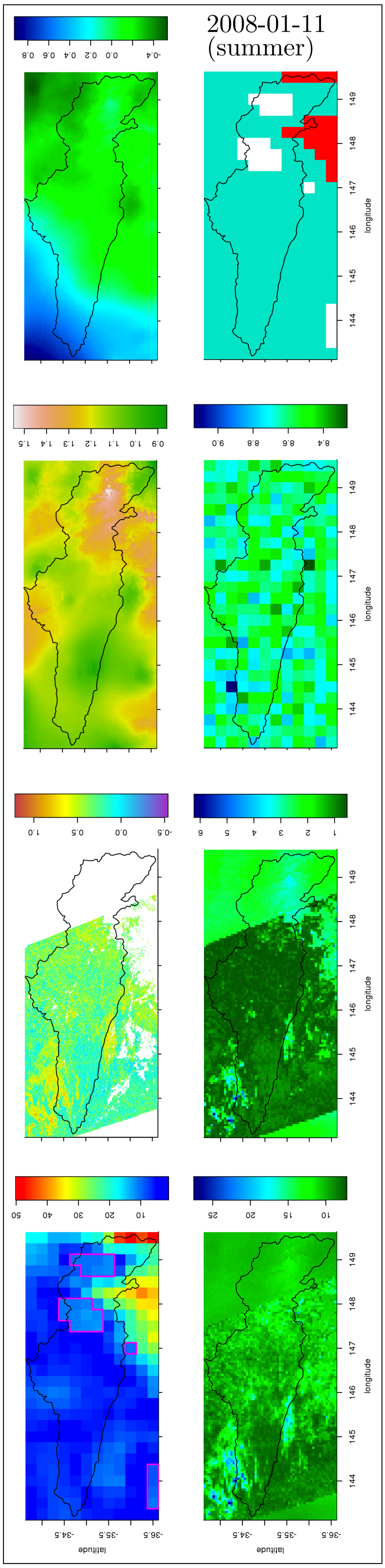

2005-06-13
(winter)
longitude
latitude

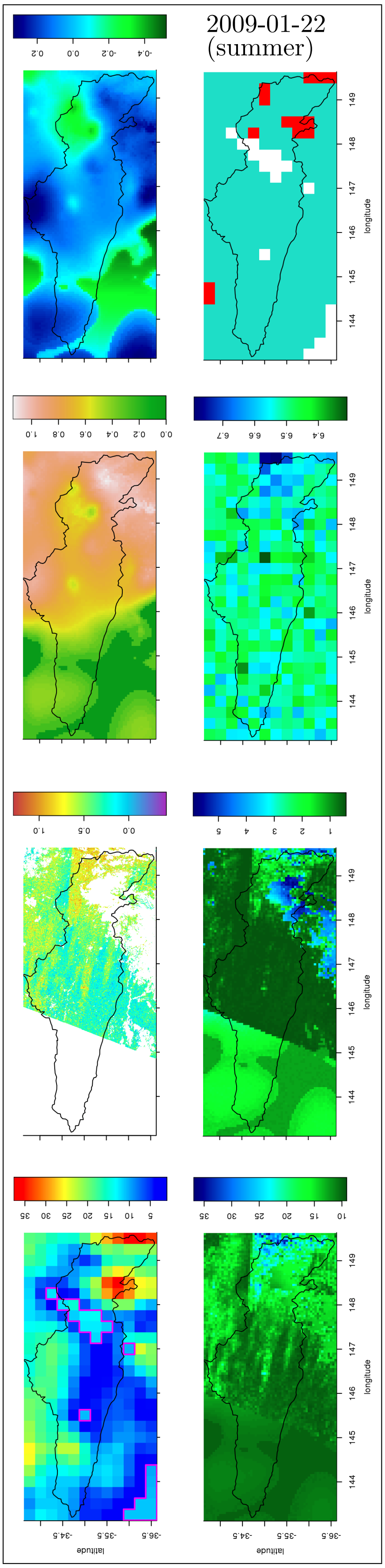

2007-06-15
(winter)
longitude
latitude


2007-06-24
(winter)


2007-06-26
(winter)


2007-01-18
(summer)


2008-01-11
(summer)


2009-01-22
(summer)
longitude
latitude

S2. Starting values for MCMC

Perform the following operations:

1. Least-squares regression-without-intercept of $\boldsymbol{q}$ on $\tilde{\boldsymbol{\psi}}^{(0)}$, with bivariate data

$$\left\{\left\{\left(\tilde{\psi}_{mr}^{(0)}, q_{mr1}\right), \left(\tilde{\psi}_{mr}^{(0)}, q_{mr2}\right), \ldots, \left(\tilde{\psi}_{mr}^{(0)}, q_{mrK_{mr}}\right)\right\}_{r=1}^{25}\right\}_{m=1}^{M}$$

over m, r where qs are observed. See below for setting $\tilde{\boldsymbol{\psi}}^{(0)}$. Note that there is a single variance estimate from this procedure.

2. Least-squares regression of $\tilde{\boldsymbol{\psi}}^{(0)}$ on $\boldsymbol{p} - p^*\mathbf{1}$ (where $\mathbf{1}$ is a vector of 1s), with bivariate data

$$\left\{\left\{\left(p_{mr} - p^*, \tilde{\psi}_{mr}^{(0)}\right)\right\}_{r=1}^{25}\right\}_{m=1}^{M}.$$

3. Least-squares regression-without-intercept of $\boldsymbol{p}$ on $\mathbb{H}$, with 6-variate data

$$\left\{\left\{\left(x_{mr1}, x_{mr2}, x_{mr1}x_{mr2}, x_{mr1}^2, x_{mr2}^2, p_{mr}\right)\right\}_{r=1}^{25}\right\}_{m=1}^{M}.$$

Then, aside from the arbitrary starting value for τ, the following starting values reflect our intuition for model parameters:

$$\boldsymbol{\phi}^{(0)} = \mathbf{0}, \qquad \tau^{(0)} = 1,$$

$$\psi_{mr}^{(0)} = \begin{cases} v_m \text{ for all } r & \text{if } v_m \text{ observed} \\ \text{mean of all observed } v_n\text{s} & \text{if } v_m \text{ unobserved} \end{cases}, \qquad \tilde{\psi}_{mr}^{(0)} = \log \psi_{mr}^{(0)},$$

$$\alpha_0^{(0)} = 0, \qquad \alpha_1^{(0)} = 1,$$

$$\left(\sigma_\delta^{(0)}\right)^2 = \text{sample variance of all observed } v_n\text{s},$$

$$\alpha_3^{(0)} = \text{slope estimate from Operation 1},$$

$$\left(\sigma_m^{(0)}\right)^2 = \text{variance estimate from Operation 1 for all } m,$$

$$\boldsymbol{\beta}^{(0)}, \left(\sigma_\eta^{(0)}\right)^2 = \text{estimates from Operation 2},$$

$$\boldsymbol{\gamma}^{(0)}, \left(\sigma_\zeta^{(0)}\right)^2 = \text{estimates from Operation 3}.$$

Note. Ignoring missing AMSR-E values, we have $\mathrm{E}\left(v_m \,\middle|\, \boldsymbol{\psi}^{(0)}, \boldsymbol{\alpha}^{(0)}\right) = \overline{\psi}_m^{(0)}$.

Affiliation:

Grace S. Chiu (corresponding author)
CSIRO Mathematics, Informatics and Statistics
GPO Box 664, Canberra, ACT 2601, Australia
E-mail: grace.chiu@csiro.au
URL: http://www.csiro.au/people/Grace.Chiu.html

Eric A. Lehmann
CSIRO Mathematics, Informatics and Statistics
Private Bag 5, Wembley, WA 6913, Australia
E-mail: eric.lehmann@csiro.au

Joshua C. Bowden
CSIRO Information Management and Technology
306 Carmody Road, St. Lucia, QLD 4067, Australia
E-mail: josh.bowden@csiro.au

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