Supplementary Material

Optimized Methods for Estimating Missing Soil Matric Potential Values in Time Series for Irrigation Management

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# Supplementary Tables

Table A1. ELM model results for different independent input subscenarios. $C\_{E}^{i}n$ represents the combination input for ELM with *n* inputs. *i* denotes Land (L), Meteo (M) or Meteo+Land (ML).

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| **a. Meteo+Land Inputs** |
| N. Inputs | Input Combination | R | RMSE | MAE | NSE |
| $C\_{E}^{ML}$14 | [1,2,3,4,5,6,7,8,9,10,11,12,13,14] | 0.978 | 0.269 | 0.196 | 0.967 |
| $C\_{E}^{ML}$13 | [1,2,3,4,5,6,7,8,9,11,12,13,14] | 0.983 | 0.233 | 0.162 | 0.968 |
| $C\_{E}^{ML}$12 | [1,2,3,5,6,7,8,9,11,12,13,14] | 0.984 | 0.227 | 0.153 | 0.968 |
| $C\_{E}^{ML}$11 | [1,2,6,7,8,9,10,11,12,13,14] | 0.987 | 0.207 | 0.138 | 0.974 |
| $C\_{E}^{ML}$10 | [1,5,7,8,9,10,11,12,13,14] | 0.989 | 0.190 | 0.135 | 0.978 |
| $C\_{E}^{ML}$9 | [1,5,7,8,9,10,12,13,14] | 0.989 | 0.188 | 0.138 | 0.978 |
| $C\_{E}^{ML}$8 | [1,5,7,8,11,12,13,14] | 0.990 | 0.180 | 0.133 | 0.980 |
| $C\_{E}^{ML}$7 | [1,5,6,7,8,12,13] | 0.990 | 0.179 | 0.130 | 0.980 |
| $C\_{E}^{ML}$6 | [2,5,7,8,11,12] | 0.991 | 0.171 | 0.123 | 0.982 |
| $C\_{E}^{ML}$**5** | **[5,7,8,12,14]** | **0.992** | **0.164** | **0.122** | **0.983** |
| $C\_{E}^{ML}$4 | [5,7,8,14] | 0.991 | 0.170 | 0.126 | 0.982 |
| $C\_{E}^{ML}$3 | [7,8,11] | 0.982 | 0.239 | 0.168 | 0.965 |
| $C\_{E}^{ML}$2 | [7,8] | 0.969 | 0.322 | 0.225 | 0.936 |
| $C\_{E}^{ML}$1 | [8] | 0.939 | 0.444 | 0.318 | 0.879 |
| **b. Meteo Inputs** |
| $C\_{E}^{M}$4 | [1,2,3,4] | 0.576 | 1.073 | 0.739 | 0.294 |
| $C\_{E}^{M}$**3** | **[1,3,4]** | **0.596** | **1.047** | 0.726 | **0.328** |
| $C\_{E}^{M}$2 | [1,3] | 0.555 | 1.066 | **0.701** | 0.303 |
| $C\_{E}^{M}$1 | [3] | 0.361 | 1.191 | 0.836 | 0.129 |
| **c. Land Inputs** |
| $C\_{E}^{L}$10 | [5,6,7,8,9,10,11,12,13,14] | 0.987 | 0.205 | 0.150 | 0.974 |
| $C\_{E}^{L}$9 | [5,6,7,8,9,10,12,13,14] | 0.989 | 0.194 | 0.141 | 0.977 |
| $C\_{E}^{L}$8 | [5,6,7,8,9,10,12,13] | 0.990 | 0.185 | 0.126 | 0.979 |
| $C\_{E}^{L}$7 | [5,6,8,9,10,12,14] | 0.990 | 0.179 | 0.122 | 0.980 |
| $C\_{E}^{L}$6 | [5,7,8,9,10,14] | 0.991 | 0.174 | **0.116** | 0.981 |
| $C\_{E}^{L}$**5** | **[5,7,8,12,14]** | **0.992** | **0.164** | 0.122 | **0.983** |
| $C\_{E}^{L}$4 | [5,7,8,14] | 0.991 | 0.170 | 0.126 | 0.982 |
| $C\_{E}^{L}$3 | [7,8,11] | 0.982 | 0.239 | 0.168 | 0.965 |
| $C\_{E}^{L}$2 | [7,8] | 0.969 | 0.322 | 0.225 | 0.936 |
| $C\_{E}^{L}$1 | [8] | 0.939 | 0.444 | 0.318 | 0.879 |

Table A2. *k*NN model results for different independent input subscenarios.$C\_{k}^{i}n$ represents the combination input for *k*NN with *n* inputs. *i* denotes Land (L), Meteo (M) or Land+Meteo (LM).

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| **a. Meteo+Land Inputs** |
| N. Inputs | Input Combination | R | RMSE | MAE | NSE |
| $C\_{k}^{ML}$14 | [1,2,3,4,5,6,7,8,9,10,11,12,13,14] | 0.472 | 1.150 | 0.924 | 0.188 |
| $C\_{k}^{ML}$13 | [1,2,3,4,5,7,8,9,10,11,12,13,14] | 0.511 | 1.113 | 0.896 | 0.240 |
| $C\_{k}^{ML}$12 | [1,2,3,4,5,8,9,10,11,12,13,14] | 0.552 | 1.075 | 0.867 | 0.290 |
| $C\_{k}^{ML}$11 | [1,2,4,5,8,9,10,11,12,13,14] | 0.591 | 1.038 | 0.837 | 0.339 |
| $C\_{k}^{ML}$10 | [1,2,4,5,8,9,10,11,12,13] | 0.631 | 0.994 | 0.805 | 0.394 |
| $C\_{k}^{ML}$9 | [1,2,4,5,8,9,10,11,12] | 0.672 | 0.947 | 0.767 | 0.450 |
| $C\_{k}^{ML}$8 | [1,2,4,5,8,9,10,11] | 0.706 | 0.909 | 0.732 | 0.493 |
| $C\_{k}^{ML}$7 | [1,2,4,5,8,9,10] | 0.749 | 0.868 | 0.694 | 0.537 |
| $C\_{k}^{ML}$6 | [1,4,5,8,9,10] | 0.781 | 0.820 | 0.653 | 0.587 |
| $C\_{k}^{ML}$5 | [1,4,5,8,9] | 0.834 | 0.769 | 0.598 | 0.637 |
| $C\_{k}^{ML}$4 | [4,5,8,9] | 0.842 | 0.709 | 0.561 | 0.691 |
| $C\_{k}^{ML}$3 | [4,8,9] | 0.890 | 0.638 | 0.491 | 0.750 |
| $C\_{k}^{ML}$2 | [5,8] | 0.909 | 0.541 | 0.429 | 0.821 |
| $C\_{k}^{ML}$**1** | **[8]** | **0.937** | **0.455** | **0.336** | **0.873** |
| **b. Meteo Inputs** |
| $C\_{k}^{M}$4 | [1,2,3,4] | 0.417 | 1.656 | 1.289 | -0.684 |
| $C\_{k}^{M}$**3** | **[1,2,4]** | **0.420** | 1.581 | **1.211** | -0.535 |
| $C\_{k}^{M}$2 | [1,2] | 0.384 | **1.558** | 1.219 | **-0.491** |
| $C\_{k}^{M}$1 | [3] | 0.303 | 2.132 | 1.734 | -1.790 |
| **c. Land Inputs** |
| $C\_{k}^{L}$10 | [5,6,7,8,9,10,11,12,13,14] | 0.547 | 1.123 | 0.910 | 0.226 |
| $C\_{k}^{L}$9 | [5,7,8,9,10,11,12,13,14] | 0.589 | 1.077 | 0.874 | 0.288 |
| $C\_{k}^{L}$8 | [5,7,8,9,10,11,12,14] | 0.628 | 1.026 | 0.835 | 0.354 |
| $C\_{k}^{L}$7 | [5,7,8,9,10,11,12] | 0.671 | 0.970 | 0.794 | 0.423 |
| $C\_{k}^{L}$6 | [5,7,8,9,10,11] | 0.705 | 0.917 | 0.748 | 0.484 |
| $C\_{k}^{L}$5 | [5,7,8,9,10] | 0.746 | 0.854 | 0.699 | 0.552 |
| $C\_{k}^{L}$4 | [5,7,8,9] | 0.798 | 0.774 | 0.633 | 0.632 |
| $C\_{k}^{L}$3 | [5,8,9] | 0.854 | 0.669 | 0.554 | 0.725 |
| $C\_{k}^{L}$2 | [5,8] | 0.909 | 0.541 | 0.429 | 0.821 |
| $C\_{k}^{L}$**1** | **[8]** | **0.937** | **0.455** | **0.336** | **0.873** |

Table A3. *ga*IDW model results for different independent input subscenarios. $C\_{g}^{L}n$ represents the combination input for *ga*IDW with *n* Land inputs.

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| **Land Inputs** |
| N. Inputs | Input Combination | R | RMSE | MAE | NSE |
| $C\_{g}^{L}$10 | [5,6,7,8,9,10,11,12,13,14] | 0.383 | 1.328 | 1.073 | -0.083 |
| $C\_{g}^{L}$9 | [5,7,8,9,10,11,12,13,14] | 0.440 | 1.272 | 1.029 | 0.007 |
| $C\_{g}^{L}$8 | [5,8,9,10,11,12,13,14] | 0.505 | 1.215 | 0.991 | 0.093 |
| $C\_{g}^{L}$7 | [5,8,9,10,11,12,13] | 0.555 | 1.157 | 0.950 | 0.178 |
| $C\_{g}^{L}$6 | [5,8,9,10,11,12] | 0.610 | 1.092 | 0.903 | 0.268 |
| $C\_{g}^{L}$5 | [5,8,9,10,11] | 0.644 | 1.038 | 0.857 | 0.339 |
| $C\_{g}^{L}$4 | [5,8,9,10] | 0.691 | 0.961 | 0.802 | 0.433 |
| $C\_{g}^{L}$3 | [5,8,9] | 0.758 | 0.849 | 0.708 | 0.557 |
| $C\_{g}^{L}$2 | [8,9] | 0.844 | 0.691 | 0.584 | 0.707 |
| $C\_{g}^{L}$**1** | **[8]** | **0.937** | **0.455** | **0.336** | **1.000** |

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