Assessing the Impact of Land Use and Land Cover Data Representation on Weather Forecast Quality: A Case Study in Central Mexico

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Table S1. LULC change matrix for USGS1993-NALCMS2005 (area in km²). Figure 3c shows in white the areas that changed (the elements off the diagonal of the matrix) while yellow represents the areas that did not show LULC changes (diagonal of the matrix).

| Land cover class | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | Total |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 1-Urban and Built-Up Land | 660 | 18 | 0  | 0  | 0  | 0  | 7  | 6  | 0  | 0  | 0  | 0  | 14 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 705  |
| 2-Dryland Cropland and Pasture | 399 | 3,985 | 0  | 0  | 0  | 355 | 612 | 0  | 0  | 502 | 423 | 216 | 620 | 46  | 0  | 104 | 0  | 0  | 21 | 7,283 |
| 3-Irrigated Cropland and Pasture | 39 | 985 | 0  | 0  | 0  | 160 | 340 | 0  | 0  | 594 | 0  | 2  | 5  | 10 | 0  | 0  | 0  | 0  | 0  | 2,135 |
| 5-Cropland/Grassland Mosaic | 1 | 162 | 0  | 0  | 0  | 21  | 301 | 0  | 0  | 309 | 12 | 111 | 240 | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1,158 |
| 6-Cropland/Woodland Mosaic | 0 | 1,701 | 0  | 0  | 0  | 0  | 182 | 0  | 0  | 531 | 284 | 118 | 1,225 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 4,041 |
| 7-Grassland | 1,522 | 8,674 | 0  | 0  | 0  | 5,948 | 7,418 | 0  | 0  | 1,501 | 0  | 311 | 130 | 137 | 1  | 20 | 0  | 0  | 0  | 25,662 |
| 8-Shrubland | 1,466 | 9,675 | 0  | 0  | 0  | 4,339 | 7,223 | 0  | 0  | 1,979 | 2  | 280 | 128 | 108 | 2  | 50 | 0  | 0  | 0  | 25,252 |
| 9-Mixed Shrubland/Grassland | 3 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 4  | 0  | 0  | 0  | 0  | 0  | 7  |
| 10-Savanna | 102 | 6,931 | 0  | 0  | 0  | 169 | 3,772 | 0  | 0  | 5,589 | 174 | 599 | 713 | 39 | 0  | 2  | 0  | 0  | 0  | 0  | 18,090 |
| 11-Deciduous Broadleaf Forest | 6 | 143 | 0  | 0  | 0  | 18 | 1  | 0  | 0  | 0  | 0  | 0  | 3  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 171 |

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| Category                          | 13-Evergreen Broadleaf Forest | 14-Evergreen Needleleaf Forest | 15-Mixed Forest | 16-Water Bodies | 18-Wooded Wetland | 19-Barren or Sparsely Vegetated | 21-Wooded Tundra | 24-Snow or Ice | Total USGS |
|----------------------------------|------------------------------|------------------------------|-----------------|-----------------|-------------------|---------------------------------|-----------------|---------------|-----------|
| Elevation                        | 0                            | 122                          | 67              | 0               | 0                 | 0                               | 1               | 0             | 4,388     |
| Latitude                         | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 12,011    |
| Temperature                      | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 27,722    |
| Soil Moisture                     | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 16,058    |
| Soils                            | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 1,346     |
| Climate                          | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 7,670     |
| Vegetation                       | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 10,996    |
| Hydrology                        | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 476       |
| Ecosystem                         | 0                            | 0                            | 0               | 0               | 0                 | 0                               | 0               | 0             | 233       |
| Total                             | 297                          | 8,389                        | 29,763          | 136             | 0                 | 0                               | 1               | 0             | 123,090   |
Figure S1. Maps of monthly average temperature (°C) for the 48-hours forecast. Dry season (January (a-b) and April (d-e)), Rainy season (July (g-h) and September (j-k)). First column shows the numerical simulations using the USGS dataset, second column using the NALCMS updated dataset, and third column shows the absolute value of the differences between NALCMS minus USGS.
Figure S2. Maps of monthly average daily maximum temperature (°C) for the 48-hours forecast. Dry season (January (a-b) and April (d-e)), Rainy season (July (g-h) and September (j-k)). First column shows the numerical simulations using the USGS dataset, second column using the NALCMS updated dataset, and third column shows the absolute difference of average daily maximum temperatures between NALCMS and USGS.
Figure S3. Maps of monthly average daily minimum temperature (°C) for the 48-hours forecast. Dry season (January (a-b) and April (d-e)), Rainy season (July (g-h) and September (j-k)). First column shows the numerical simulations using the USGS dataset, second column using the NALCMS updated dataset, and third column shows the absolute difference of average daily minimum temperatures between NALCMS and USGS.
Figure S4. Absolute difference maps of monthly average daily maximum wind (km/h) between NALCMS and USGS for the 48-hours forecast. Dry season (January (a-b) and April (c-d)), Rainy season (July (e-f) and September (g-h)). Left column shows the result of the operation considering only the NALCMS contribution (positive values of the subtraction between NALCMS and USGS), and right column shows the result of the difference considering the USGS contribution (absolute value of the negative values of the difference NALCMS - USGS).
Figure S5. Absolute difference maps of monthly average daily minimum wind (km/h) between NALCMS and USGS for the 48-hours forecast. Dry season (January (a-b) and April (c-d)), Rainy season (July (e-f) and September (g-h)). Left column shows the result of the operation considering only the NALCMS2005 contribution (positive values of the subtraction between NALCMS and USGS), and right column shows the result of the difference considering the USGS1993 contribution (absolute value of the negative values of the difference between NALCMS and USGS).
Figure S6. Maps of average daily accumulated precipitation for the 48-hours forecast. Dry season (January (a-b) and April (c-d)), Rainy season (July (e-f) and September (g-h)). First column shows the numerical simulations using the NALCMS dataset, second column using the USGS dataset.
Figure S7. Absolute difference maps of average daily accumulated precipitation between NALCMS and USGS for the 48-hours forecast. Dry season (January (a-b) and April (c-d)), Rainy season (July (e-f) and September (g-h)). Left column shows the result of the operation considering only the NALCMS contribution (positive values of the subtraction between NALCMS and USGS), and right column shows the result of the difference considering the USGS contribution (absolute value of the negative values of the difference between NALCMS and USGS).
