NARCCAP MM5
and
Some Verrrry Preliminary Results of Simulations of Winds

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Model

NCAR/Penn State Non-hydrostatic MM5 (V3)

- Kain-Fritsch cumulus convection
- Mixed-phase (Reisner) microphysics
- RRTM radiation
- Non-local MRF PBL
- Five layer soil model (1, 2, 4, 8, 16 cm)

Noah Land Surface Model
NOAH LSM Schematic (Chen and Dudhia, 2001)
Standard Landcover Types

1) Broadleaf-evergreen trees
2) Broadleaf-deciduous trees
3) Broadleaf and needleleaf trees
4) Needleleaf-evergreen trees
5) Needleleaf-deciduous trees (larch)
6) Broadleaf trees with groundcover
7) Groundcover only
8) Broadleaf shrubs with groundcover
9) Broadleaf shrubs with bare soil
10) Dwarf trees/shrubs with groundcover (tundra)
11) Bare soil
12) Cultivations
13) Wetland
14) Dry coastal complex
15) Water
16) Glacial
<table>
<thead>
<tr>
<th></th>
<th>Standard Soil Textures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sand</td>
</tr>
<tr>
<td>2</td>
<td>Loamy sand</td>
</tr>
<tr>
<td>3</td>
<td>Sandy loam</td>
</tr>
<tr>
<td>4</td>
<td>Silt loam</td>
</tr>
<tr>
<td>5</td>
<td>Silt</td>
</tr>
<tr>
<td>6</td>
<td>Loam</td>
</tr>
<tr>
<td>7</td>
<td>Sandy clay loam</td>
</tr>
<tr>
<td>8</td>
<td>Silty clay loam</td>
</tr>
<tr>
<td>9</td>
<td>Clay loam</td>
</tr>
<tr>
<td>10</td>
<td>Sandy clay</td>
</tr>
<tr>
<td>11</td>
<td>Silty clay</td>
</tr>
<tr>
<td>12</td>
<td>Clay</td>
</tr>
<tr>
<td>13</td>
<td>Organic material</td>
</tr>
<tr>
<td>14</td>
<td>Water</td>
</tr>
<tr>
<td>15</td>
<td>Bedrock</td>
</tr>
<tr>
<td>16</td>
<td>Other (land–ice)</td>
</tr>
</tbody>
</table>
Arm Chair Thought:

Models that simulate pressure fields pretty well should simulate wind speeds pretty well

but...

Surface winds simulated by models are subject to errors in both pressure fields and surface-layer parameterizations that translate lowest-model-level winds to the 10-m level
A 1% error in wind speed estimates for a 100 MW wind generation facility can lead to losses approaching $12,000,000 over the plant lifetime.

Fig. 5. Monthly wind speed anomalies (m s⁻¹) at the 13 70-m wind-monitoring sites. Anomalies are computed from monthly means derived from the 1993–2003 base period.
Mean Monthly Wind Speeds

Des Moines, IA

Wind speeds too high after 1990 – slight negative trend

Caribou, ME

Wind speeds too high for entire period – no trend
Diurnal Cycles

Mean April Diurnal Cycle
1979-2004
Des Moines
Wind Speed (m/s)
Model: blue, Observed: red

Mean April Diurnal Cycle
1979-2004
Indianapolis

Mean April Diurnal Cycle
1979-2004
Peoria

Mean April Diurnal Cycle
1979-2004
Caribou

Mean April Diurnal Cycle
1979-2004
Fort Worth

Mean April Diurnal Cycle
1979-2004
Jacksonville

Hour
0 3 6 9 12 15 18 21
Wind Speed (m/s)
4 5 6 7
Model: blue, Observed: red
Continued...

Mean April Nighttime Wind Speeds
Des Moines

00-09 UTC winds are stronger up to 2001

00-09 UTC winds weaker up to 1994
July and December Mean Diurnal Cycles

Peoria

- July Diurnal Cycle (MODEL)
- July Diurnal Cycle (OBS)
- December Diurnal Cycle (MODEL)
- December Diurnal Cycle (OBS)

Wind Speed (m/s)

Years: 1979 to 2003