Table S1. Summary of the AERONET and particulate matter (PM) measurement stations used to evaluate modelled AOD and PM. The geographical positions of the stations are listed as: latitude, longitude, elevation above sea level. The Principal Investigator(s) (PI) responsible for each dataset are shown in the final column. Ascension Island is listed with the African sites because it samples outflow of biomass burning aerosol from the African continent (Swap et al., 1996). When comparing the model and observations, we restrict the time period to between January 2003 and December 2011 (according to the availability of biomass burning emissions data).

<table>
<thead>
<tr>
<th>Station</th>
<th>Country</th>
<th>Observation period</th>
<th>Geographical position</th>
<th>Location classification</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>South America</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Porto Velho (PM$_{2.5}$)</td>
<td>Rondonia, Brazil</td>
<td>25/09/09 - 04/10/12</td>
<td>8.687°S, 63.867°W, 94.0 m</td>
<td>Heavily impacted by biomass burning</td>
<td>Paulo Artaxo</td>
</tr>
<tr>
<td>Alta Floresta (PM$_{2.5}$)</td>
<td>Mato Grosso, Brazil</td>
<td>24/08/92 - 06/03/05</td>
<td>9.871°S, 56.104°W, 277.0 m</td>
<td>Rural, city outskirts, heavily impacted by biomass burning</td>
<td>Paulo Artaxo</td>
</tr>
<tr>
<td>Manaus, TT34 tower (PM$_{2.5}$)</td>
<td>INPA Cuieiras forest reserve,</td>
<td>10/02/08 - 25/10/11</td>
<td>2.594°S, 60.209°W, 110.0 m</td>
<td>Preserved forest</td>
<td>Paulo Artaxo</td>
</tr>
<tr>
<td>Location</td>
<td>City/Town</td>
<td>Dates</td>
<td>Coordinates</td>
<td>Type</td>
<td>Authors</td>
</tr>
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</tr>
<tr>
<td>Santarem, K67 tower (PM2.5)</td>
<td>Tapajos, Pará, Brazil</td>
<td>04/02/00 - 01/04/07</td>
<td>2.850°S, 54.867°W, 70.0 m</td>
<td>Preserved Forest</td>
<td>Paulo Artaxo</td>
</tr>
<tr>
<td><strong>Alta Floresta (AERONET)</strong></td>
<td>Mato Grosso, Brazil</td>
<td>21/06/93 - 15/01/14</td>
<td>9.871°S, 56.104°W, 277.0 m</td>
<td>Rural, town outskirts</td>
<td>Brent Holben, Paulo Artaxo</td>
</tr>
<tr>
<td>Cuiaba Miranda (AERONET)</td>
<td>Mato Grosso, Brazil</td>
<td>23/03/01 - 07/10/13</td>
<td>15.730°S, 56.021°W, 210.0 m</td>
<td>Rural, city outskirts</td>
<td>P. Artaxo, J. de Souza Nogueira, E. Ojeda de Almeida Filho, A. Jorge</td>
</tr>
<tr>
<td><strong>Rio Branco (AERONET)</strong></td>
<td>Acre, Brazil</td>
<td>02/07/00 - 10/11/12</td>
<td>9.957°S, 67.869°W, 212.0 m</td>
<td>Urban, within city limits</td>
<td>Brent Holben, Paulo Artaxo</td>
</tr>
<tr>
<td>Ji Parana SE (AERONET)</td>
<td>Rondonia, Brazil</td>
<td>19/01/06 - 09/06/13</td>
<td>10.934°S, 61.852°W, 218.0 m</td>
<td>Rural</td>
<td>Paulo Artaxo</td>
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<tr>
<td>Abracos Hill (AERONET)</td>
<td>Rondonia, Brazil</td>
<td>22/01/99 - 09/10/05</td>
<td>10.760°S, 62.358°W, 200.0 m</td>
<td>Rural</td>
<td>Brent Holben, Paulo Artaxo</td>
</tr>
<tr>
<td>Belterra (AERONET)</td>
<td>Para, Brazil</td>
<td>21/09/99 - 24/04/05</td>
<td>2.648°S, 54.952°W, 70.0 m</td>
<td>Rural</td>
<td>B. Holben, P. Artaxo</td>
</tr>
<tr>
<td>Santa Cruz (AERONET)</td>
<td>Bolivia</td>
<td>20/01/99 - 26/11/13</td>
<td>17.802°S, 63.178°W, 442.0 m</td>
<td>Urban, city centre</td>
<td>B. Holben</td>
</tr>
<tr>
<td>Santa Cruz UTESPA (AERONET)</td>
<td>Bolivia</td>
<td>18/09/06 - 04/11/08</td>
<td>17.767°S, 63.201°W, 432.0 m</td>
<td>Urban, within city limits</td>
<td>B. Holben</td>
</tr>
<tr>
<td><strong>Equatorial Asia &amp; Philippines</strong></td>
<td></td>
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<tr>
<td>Singapore (AERONET)</td>
<td>Singapore</td>
<td>14/11/06 - 19/10/12</td>
<td>103.780°E, 1.298°N, 30.0 m</td>
<td>Urban, city centre</td>
<td>S.-C. Liew, S. V. Salinas Cortijo</td>
</tr>
<tr>
<td>Bandung (AERONET)</td>
<td>Java, Indonesia</td>
<td>13/05/09 - 28/09/11</td>
<td>107.61°E, 6.888°N,</td>
<td>Urban, city centre</td>
<td>P. Lestari, B. Holben</td>
</tr>
<tr>
<td>Manila Observatory (AERONET)</td>
<td>Quezon City, Philippines</td>
<td>21/01/09 - 30/12/11</td>
<td>121.08°E, 14.635°N, 63.0 m</td>
<td>Urban, within city limits</td>
<td>N. Lagrosas, B. Holben</td>
</tr>
<tr>
<td>ND Marbel Univ. (AERONET)</td>
<td>Koronadal, Philippines</td>
<td>17/12/09 - 19/01/12</td>
<td>124.843°E, 6.496°N, 70.0 m</td>
<td>Urban, city centre</td>
<td>S. Dorado</td>
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<tr>
<td><strong>Indochina</strong></td>
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<tr>
<td>Songkhla Met. Station (AERONET)</td>
<td>Thailand</td>
<td>11/01/07 - 13/12/11</td>
<td>100.61°E, 7.184°N,</td>
<td>Urban, city centre</td>
<td>S. Janjai</td>
</tr>
<tr>
<td>Chulalongkorn (AERONET)</td>
<td>Thailand</td>
<td>19/02/03 - 25/09/04</td>
<td>100.53°E, 13.736°N,</td>
<td>Urban, city centre</td>
<td>B. Holben</td>
</tr>
<tr>
<td>Ubon Ratchathani (AERONET)</td>
<td>Thailand</td>
<td>09/10/09 - 07/11/12</td>
<td>104.87°E, 15.246°N,</td>
<td>Urban, within city limits</td>
<td>S. Janjai</td>
</tr>
<tr>
<td>Silpakorn University (AERONET)</td>
<td>Thailand</td>
<td>15/08/06 - 11/12/11</td>
<td>100.04°E, 13.819°N,</td>
<td>Urban, city outskirts</td>
<td>S. Janjai</td>
</tr>
<tr>
<td>Location</td>
<td>Country</td>
<td>Start Date</td>
<td>End Date</td>
<td>Latitude/Latitude</td>
<td>Location Type</td>
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<tr>
<td>Chiang Mai Met. Station</td>
<td>Thailand</td>
<td>17/09/06 - 28/07/11</td>
<td>98.973°E, 18.771°N</td>
<td>Urban, city outskirts</td>
<td>S. Janjai</td>
</tr>
<tr>
<td>Phimai</td>
<td>Thailand</td>
<td>18/02/03 - 10/04/08</td>
<td>102.56°E, 15.182°N</td>
<td>Rural</td>
<td>B. Holben</td>
</tr>
<tr>
<td>Mukdahan</td>
<td>Thailand</td>
<td>07/11/03 - 30/05/10</td>
<td>104.68°E, 16.607°N</td>
<td>Rural</td>
<td>Brent Holben</td>
</tr>
<tr>
<td>Bac Giang</td>
<td>Vietnam</td>
<td>03/03/03 - 26/12/09</td>
<td>106.23°E, 21.291°N</td>
<td>Rural, city outskirts</td>
<td>N. Xuan Anh</td>
</tr>
<tr>
<td>Bac Lieu</td>
<td>Vietnam</td>
<td>10/03/03 - 25/04/11</td>
<td>105.73°E, 9.280°N</td>
<td>Rural, city outskirts</td>
<td>N. Xuan Anh</td>
</tr>
<tr>
<td>Africa</td>
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<tr>
<td>Ilorin</td>
<td>Ilorin, Nigeria</td>
<td>25/04/98 - 13/09/14</td>
<td>8.320°N, 4.340°E</td>
<td>Rural, heavily impacted by dust emissions</td>
<td>R. T. Pinker</td>
</tr>
<tr>
<td>ICIPE-Mbita</td>
<td>Mbita, Kenya</td>
<td>20/03/06 - 10/04/14</td>
<td>0.417°S, 34.200°E, 1125.0 m</td>
<td>Sub-urban/rural, coastal Lake Victoria</td>
<td>B. Holben</td>
</tr>
<tr>
<td>Mongu</td>
<td>Mongu, Zambia</td>
<td>27/06/95 - 15/01/10</td>
<td>15.254°S, 23.151°E, 1107.0 m</td>
<td>Urban, within city limits</td>
<td>B. Holben</td>
</tr>
<tr>
<td>Skuzkuza</td>
<td>Skukuza, South Africa</td>
<td>19/07/98 - 03/08/11</td>
<td>24.992°S, 31.588°E, 150.0 m</td>
<td>Rural</td>
<td>B. Holben, S. Piketh</td>
</tr>
<tr>
<td>Wits University</td>
<td>Johannesburg, South Africa</td>
<td>09/05/02 - 14/11/11</td>
<td>26.192°S, 28.029°E, 1775.0 m</td>
<td>Urban, city centre</td>
<td>S. Piketh</td>
</tr>
<tr>
<td>Ascension Island</td>
<td>Ascension Island</td>
<td>20/11/98 - 31/12/13</td>
<td>7.976°S, 14.414°W, 30.0 m</td>
<td>Island/coastal, Atlantic Ocean</td>
<td>B. Holben</td>
</tr>
</tbody>
</table>