



*Supplement of*

## **Extreme Saharan dust events expand northward over the Atlantic and Europe, prompting record-breaking $PM_{10}$ and $PM_{2.5}$ episodes**

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# Supplement

## **Maximum values of the 1-hour PM<sub>10</sub> and PM<sub>2.5</sub> concentrations**

Figure S1 shows the maximum value of the 1-hour average PM<sub>10</sub> and PM<sub>2.5</sub> concentrations during the extreme dust events dx-01, dx-02, dx-03, dx-04 and dx-05 in a selection of air quality monitoring stations of the Canary Islands after assessing and re-constructing the data with the dux-r algorithm.

Figure S2 shows the maximum value of the 1-hour average PM<sub>10</sub> and PM<sub>2.5</sub> concentrations during the extreme dust event dx-06 in a selection of air quality monitoring stations of the mainland Spain and continental Portugal after assessing and re-constructing the data with the dux-r algorithm.

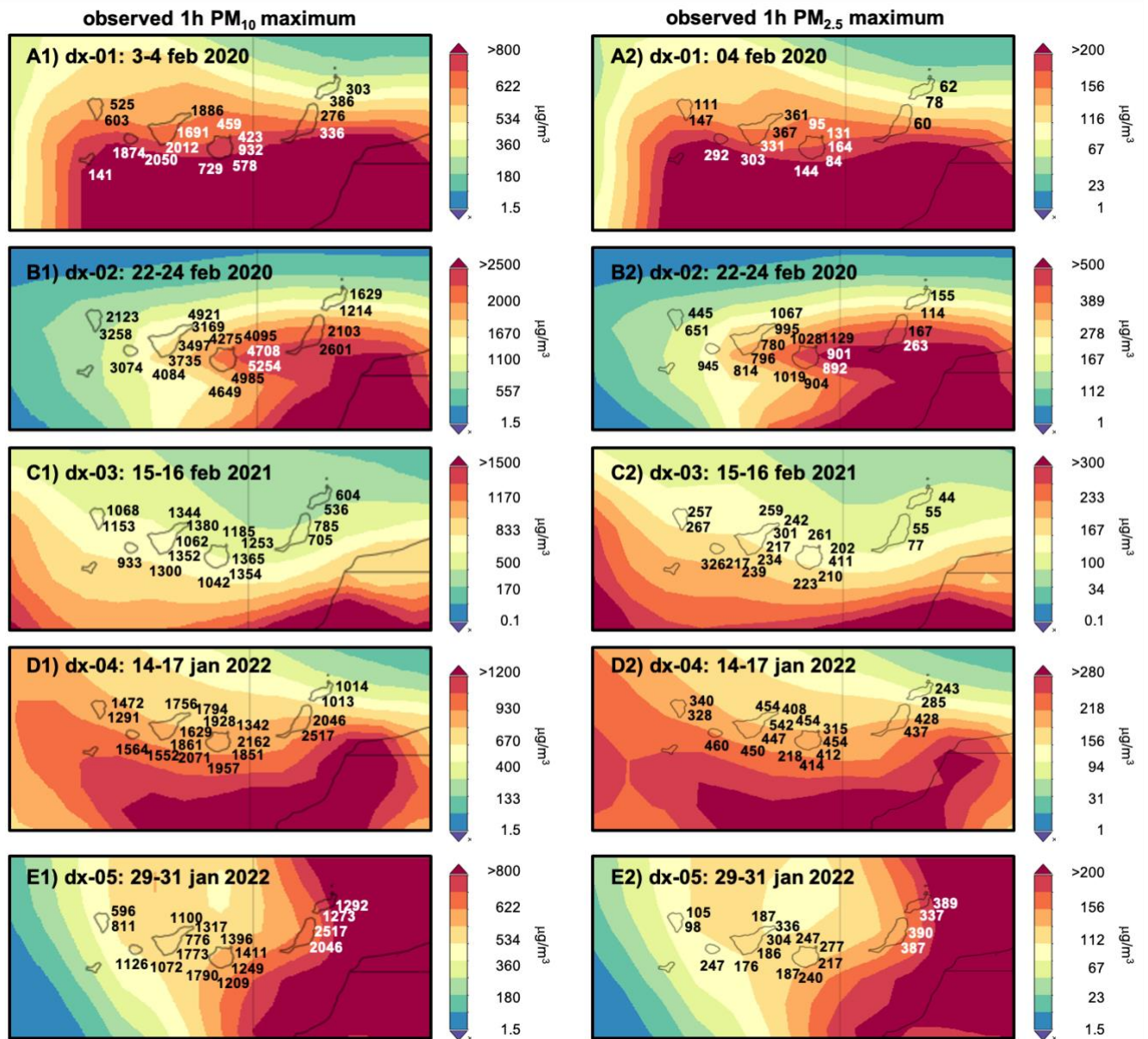


Figure S1. Maximum value of the one hour (1h) average  $PM_{10}$  and  $PM_{2.5}$  measured in the AQMS during the dx-01, dx-02, dx-03, dx-04 and dx-05 events in the Canary Islands over a map of 24h average surface dust and dust<sub>2.5</sub> concentrations of MERRA-2 reanalysis (26.5-30.0°N, 19.3-12.0°W) during dx-01 (04-feb-2020), dx-02 (23-feb-2020), dx-03 (16-feb-2021), dx-04 (16-jan-2022) and dx-05 (29-jan-2022).

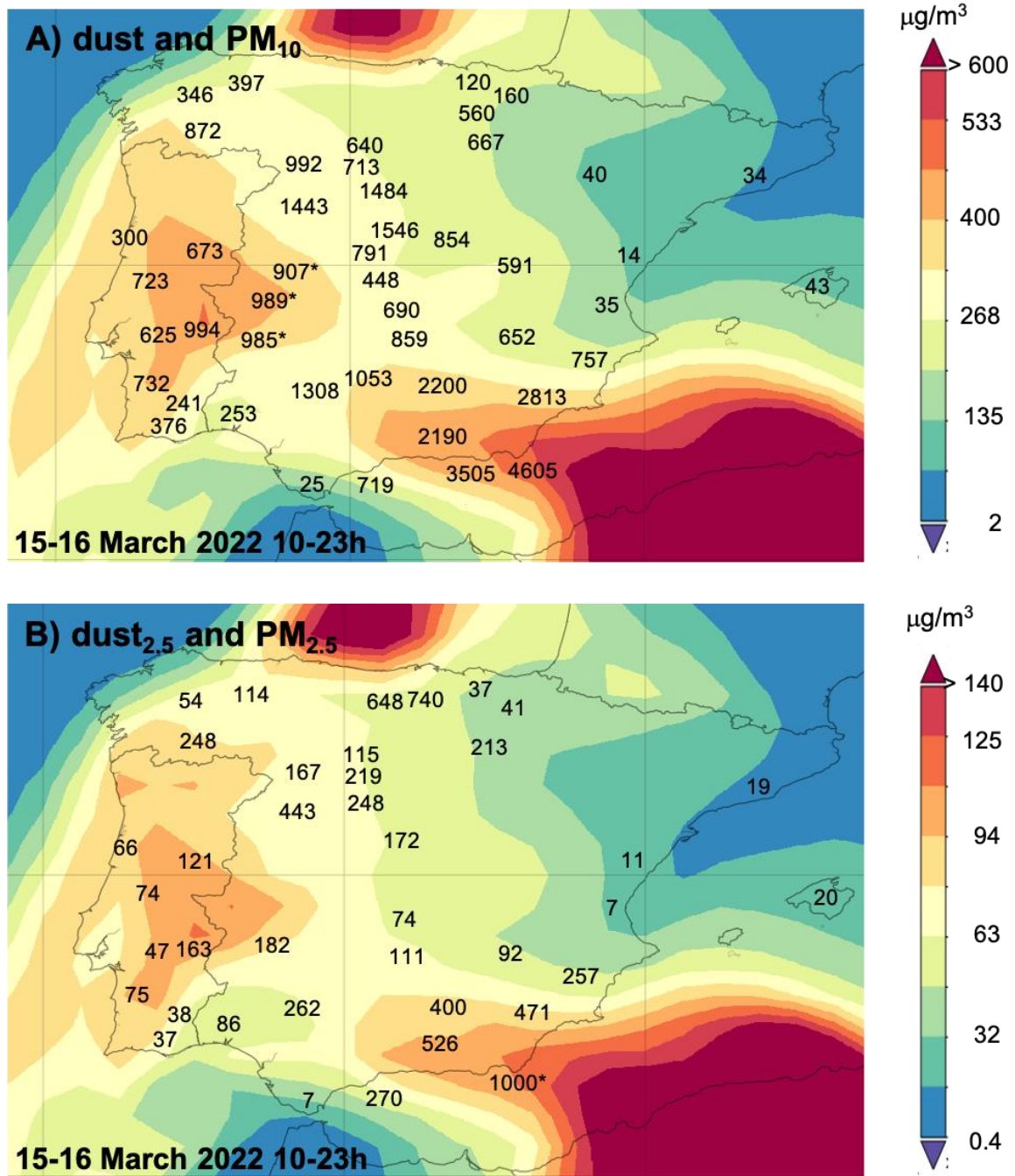


Figure S2. Maximum value of the one hour (1h) average PM<sub>10</sub> and PM<sub>2.5</sub> measured in the AQMS during the dx-06 event in mainland Spain and continental Portugal over a map of average surface dust and dust<sub>2.5</sub> concentrations of MERRA-2 reanalysis (26.5-30.0°N, 19.3-12.0°W) during 15-16 March 2022. Asterisk \* means instrument affected by saturation.

## Values of 24h average PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in mainland Spain and continental Portugal during the extreme dust event 15-16 March 2022

The historic dx-06 event (Fig.1D-1E) started the evening of 14 March 2022 (>21h), with a dust inflow in south-eastern Spain that led to 24h average PM<sub>10</sub> and PM<sub>2.5</sub> concentrations within the range 70-260 µg/m<sup>3</sup> and 25-43 µg/m<sup>3</sup> (Fig.9A1-9B1). On 15 March 2022, mainland Spain was blanketed by the massive dusty air mass (Fig.9A2-9B2), which led to 24h average PM<sub>10</sub> values of: (i) 3069 µg/m<sup>3</sup> (Mediterraneo AQMS; Almería province), 1586 µg/m<sup>3</sup> (El Ejido; Almería), 848 µg/m<sup>3</sup> (Ronda del Valle; Jaén), 621 µg/m<sup>3</sup> (Palacio de Congresos; Granada) and 587 µg/m<sup>3</sup> (Mompean; Murcia) in south-eastern Spain, 518 µg/m<sup>3</sup> in central southern Spain (Sierra Norte; Seville), (ii) 949 µg/m<sup>3</sup> (Villa del Prado; Madrid), 944\* µg/m<sup>3</sup> (Segovia-2; Segovia), 928 µg/m<sup>3</sup> (Medina del Campo; Valladolid), 841\* µg/m<sup>3</sup> (Avila-II; Avila) and 825 µg/m<sup>3</sup> (Salamanca-6; Salamanca) in central Spain, (iii) 647 µg/m<sup>3</sup> (Chamusca, Vale do Tejo) and 606 µg/m<sup>3</sup> (Terena, northern Alentejo) in central Portugal, (iv) 808\* µg/m<sup>3</sup> (Lario; León), 562 µg/m<sup>3</sup> (León-01; León), 472 µg/m<sup>3</sup> (Laza; Orense) and 371 µg/m<sup>3</sup> (Los Tojos; Cantabria) in Norwest Spain (Fig.9A2) and (v) 448 µg/m<sup>3</sup> µg/m<sup>3</sup> in northern Portugal (Santa Combinha, Norte). Some of these PM<sub>10</sub> concentrations (highlighted with asterisk\*) are actually slightly underestimated due to the automatic PM<sub>10</sub> monitor reached the saturation level (1000 µg/m<sup>3</sup>) during a few hours and the *dust-r* reconstruction method could not be applied to the lack of parallel PM<sub>2.5</sub> data. On 15 March 2022, the 24h average PM<sub>2.5</sub> values reached values of (Fig.9B2): (i) 688 µg/m<sup>3</sup> (Mediterraneo; Almería), 164 µg/m<sup>3</sup> (Ronda del Valle; Jaén), 158 µg/m<sup>3</sup> (Palacio de Congresos; Granada) in south-eastern Spain, (ii) 252 µg/m<sup>3</sup> (Salamanca-6), 153 µg/m<sup>3</sup> (Medina del Campo; Valladolid) and 119 µg/m<sup>3</sup> (Villa del Prado; Madrid) in central Spain, and (iii) 129 µg/m<sup>3</sup> (Laza; Orense) in north-west Spain.