Supplementary Information

Iron from a submarine source impacts the productive layer of the Western Tropical South Pacific (WTSP)

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Supplementary Figure 1. Segments of transect corresponding to the different aerosols sampled during the OUTPACE cruise. (The ocean color satellite products are produced by CLS. Figure courtesy of A. De Verneil)
Supplementary Figure 2. Vertical sections of salinity for the ARGO float (along the red segment in Fig. 2A) (left) and reference model outputs averaged for February 2015 to May 2015 (right). Diamonds on the X-axis represent the position of the ARGO profiles along that section; the x-axis being the orthodromic distance in kilometers (0 = profile 57 to 500 = profile 2). The model reproduces the major features and typical range of values observed in that region.
Supplementary Figure 3. Time mean section of the January 2015 to May 2015 simulations to characterize spatial and temporal plume impacts taking Volcano 8 as a source location that emitted throughout December 2014 and January 2015 (same conditions as in Fig. 2C: salinity of the source = 5, temperature = 300°, duration of the emission = 2 months, flux = 10 000 Ls\(^{-1}\)). Monthly mean snapshots of the region from January to May 2015 (from left to right and top to bottom), the last panel representing the mean of February to May 2015. On each panel, salinity anomalies (model with volcano 8 plume minus model without) are shaded and horizontal currents are represented as vectors. These snapshots are represented at 400 m (a), 300 m (b), 100 m (c) and 50 m (d). On each panel, the position of the ARGO float section of Fig. 2A is represented by a black line and...
the positions of Volcano1 and 8 are noted as crossed diamonds. IDL version 6.4, Mac OSX (Darwin), (c) 2007 ITT Visual Information Solutions URL link: http://www.harrisgeospatial.com/SoftwareTechnology/IDL.aspx was used to generate the maps.

Supplementary Figure 4. Differences of the average salinity section over the Jan-May period between 2015 and 2014 along 22°S from the ISAS13 Argo atlas. The quite similar depth of the 26.5 kg/m3 isopycnal surface for 2015 (thin line) and 2014 (dash line) indicates that this salt anomaly is compensated by a cold anomaly of (0.2°C) during the same period.
Supplementary Figure 5. Earthquakes (magnitude > 4 and above 100 km)
recorded during the period 01/12/2014 to 01/06/2015, in our study area (black
box; red stars: volcano 1 and 8). (this map was generated using
https://earthquake.usgs.gov/).

2. Supplementary Tables 1 to 2

Supplementary Table 1. Aerosols results: total iron concentrations and fluxes; soluble
iron concentrations and fluxes. The segments where aerosols were sampled are indicated
Supplementary Figure 1.

| Aerosol samples labels | Fe concentrations | Total Fe flux | DFe concentrations | DFe fluxes |
|------------------------|-------------------|--------------|--------------------|-----------|
|                        | nM.m-3            | nM.m-2.d-1   | nM.m-3             | mg.m-2.yr-1 |
| AERO 1                 | 1.375             | 1663         | nd                 |           |
| AERO 2                 | 0.041             | 49           | nd                 |           |
| AERO 3                 | 0.013             | 15           | nd                 |           |
Supplementary Table 2. Dissolved iron, nM measured between 0-500m during the OUTPACE cruise.

| Station | DFe nM | Depth (m) | Latitude | Longitude |
|---------|--------|-----------|----------|-----------|
| AERO 4  | 0.064  | 78        | 0.0012   | 1.42      | 0.029     |
| AERO 5  | nd     | nd        |          |           |           |
| AERO 6  | 0.162  | 196       | 0.0027   | 3.25      | 0.066     |
| AERO 7  | nd     | 0.0020    | 2.46     | 0.050     |
| AERO 8  | 0.085  | 102       | 0.0402   | 48.7      | 0.992     |
| AERO 9  | nd     | 0.0007    | 0.85     | 0.017     |
| AERO 10 | 1.96   | 2371      | 0.0104   | 12.6      | 0.256     |

Latitude: -18, -18.6
Longitude: 159.9, 162.1
Station: 1, 2
Depth (m): 50, 100, 30, 350, 400, 500, 80, 150, 200, 250, 300, 350, 400, 500
|       |       |   |   |   |
|-------|-------|---|---|---|
| -18.6 | 162.1 | 2 | 50 | 0.99 |
| -18.6 | 162.1 | 2 | 30 | 0.41 |
| -18.6 | 162.1 | 2 | 10 | 0.36 |
| -19.2 | 164.7 | LD_A | 500 | 0.50 |
| -19.2 | 164.7 | LD_A | 450 |   |
| -19.2 | 164.7 | LD_A | 350 | 0.50 |
| -19.2 | 164.7 | LD_A | 300 | 0.48 |
| -19.2 | 164.7 | LD_A | 250 | 0.49 |
| -19.2 | 164.7 | LD_A | 200 | 0.51 |
| -19.2 | 164.7 | LD_A | 80  | 0.52 |
| -19.2 | 164.7 | LD_A | 50  | 0.50 |
| -19.2 | 164.7 | LD_A | 30  | 0.85 |
| -19   | 165   | 3  | 500 | 0.43 |
| -19   | 165   | 3  | 400 | 0.31 |
| -19   | 165   | 3  | 350 | 0.58 |
| -19   | 165   | 3  | 300 | 0.44 |
| -19   | 165   | 3  | 250 | 0.42 |
| -19   | 165   | 3  | 200 | 0.62 |
| -19   | 165   | 3  | 150 | 0.21 |
| -19   | 165   | 3  | 100 | 0.85 |
| -19   | 165   | 3  | 70  | 0.37 |
| -19   | 165   | 3  | 50  | 0.48 |
| -19   | 165   | 3  | 30  | 0.32 |
| -19   | 165   | 3  | 10  | 0.38 |
| -20   | 168   | 4  | 500 | 0.60 |
| -20   | 168   | 4  | 400 | 0.85 |
| -20   | 168   | 4  | 350 | 0.67 |
| -20   | 168   | 4  | 300 | 0.82 |
| -20   | 168   | 4  | 250 | 0.63 |
| -20   | 168   | 4  | 200 | 0.56 |
| -20   | 168   | 4  | 150 | 0.78 |
| -20   | 168   | 4  | 100 | 0.41 |
| -20   | 168   | 4  | 70  | 0.54 |
| -20   | 168   | 4  | 50  | 1.16 |
| -20   | 168   | 4  | 30  | 0.55 |
| Value 1 | Value 2 | Value 3 | Value 4 |
|---------|---------|---------|---------|
| -20.7   | 176.4   | 8       | 30      | 1.35    |
| -20.7   | 176.4   | 8       | 10      | 0.38    |
| -21     | 178.6   | 9       | 500     | 0.39    |
| -21     | 178.6   | 9       | 398     | 1.90    |
| -21     | 178.6   | 9       | 350     | 0.42    |
| -21     | 178.6   | 9       | 300     | 1.60    |
| -21     | 178.6   | 9       | 250     | 5.50    |
| -21     | 178.6   | 9       | 200     | 6.62    |
| -21     | 178.6   | 9       | 150     | 12.10   |
| -21     | 178.6   | 9       | 100     | 63.00   |
| -21     | 178.6   | 9       | 70      | 0.76    |
| -21     | 178.6   | 9       | 50      | 0.25    |
| -21     | 178.6   | 9       | 30      | 0.22    |
| -21     | 178.6   | 9       | 10      | 0.22    |
| -20.5   | 181.5   | 10      | 500     | 2.15    |
| -20.5   | 181.5   | 10      | 400     | 1.55    |
| -20.5   | 181.5   | 10      | 350     | 7.80    |
| -20.5   | 181.5   | 10      | 300     | 0.87    |
| -20.5   | 181.5   | 10      | 250     | 4.80    |
| -20.5   | 181.5   | 10      | 200     | 1.17    |
| -20.5   | 181.5   | 10      | 150     | 0.16    |
| -20.5   | 181.5   | 10      | 120     | 5.17    |
| -20.5   | 181.5   | 10      | 70      | 11.32   |
| -20.5   | 181.5   | 10      | 50      | 0.94    |
| -20.5   | 181.5   | 10      | 30      | 0.43    |
| -20.5   | 181.5   | 10      | 10      | 0.97    |
| -19.98  | 184.33  | 11      | 500     | 0.42    |
| -19.98  | 184.33  | 11      | 400     | 0.47    |
| -19.98  | 184.33  | 11      | 350     | 0.51    |
| -19.98  | 184.33  | 11      | 300     | 1.08    |
| -19.98  | 184.33  | 11      | 250     | 0.63    |
| -19.98  | 184.33  | 11      | 200     | 0.59    |
| -19.98  | 184.33  | 11      | 150     | 0.64    |
| -19.98  | 184.33  | 11      | 100     | 0.72    |
| -19.98  | 184.33  | 11      | 70      | 0.65    |
| Value  | Unit | Parameter 1 | Parameter 2 | Parameter 3 |
|--------|------|-------------|-------------|-------------|
| -19.98 |     | 184.33      | 11          | 45          | 0.54        |
| -19.98 |     | 184.33      | 11          | 30          | 0.84        |
| -19.98 |     | 184.33      | 11          | 10          | 1.16        |
| -19.5  |     | 187.2       | 12          | 500         | 0.66        |
| -19.5  |     | 187.2       | 12          | 300         | 0.47        |
| -19.5  |     | 187.2       | 12          | 250         | 1.10        |
| -19.5  |     | 187.2       | 12          | 200         | 0.33        |
| -19.5  |     | 187.2       | 12          | 150         | 0.36        |
| -19.5  |     | 187.2       | 12          | 100         | 0.48        |
| -19.5  |     | 187.2       | 12          | 70          | 0.45        |
| -19.5  |     | 187.2       | 12          | 50          | 0.50        |
| -19.5  |     | 187.2       | 12          | 30          | 0.94        |
| -18.2  |     | 189.1       | LD_B        | 500         | 0.34        |
| -18.2  |     | 189.1       | LD_B        | 450         | 0.23        |
| -18.2  |     | 189.1       | LD_B        | 400         | 0.41        |
| -18.2  |     | 189.1       | LD_B        | 350         | 0.28        |
| -18.2  |     | 189.1       | LD_B        | 300         | 0.43        |
| -18.2  |     | 189.1       | LD_B        | 200         | 0.30        |
| -18.2  |     | 189.1       | LD_B        | 150         | 0.38        |
| -18.2  |     | 189.1       | LD_B        | 100         | 0.71        |
| -18.2  |     | 189.1       | LD_B        | 80          | 0.39        |
| -18.2  |     | 189.1       | LD_B        | 50          | 0.30        |
| -18.2  |     | 189.1       | LD_B        | 30          | 0.52        |
| -18.2  |     | 189.1       | LD_B        | 10          | 0.59        |
| -18.2  |     | 189.1       | LD_B        | 5           | 0.71        |
| -18.4  |     | 194.1       | LD_C        | 500         | 0.29        |
| -18.4  |     | 194.1       | LD_C        | 450         | 0.29        |
| -18.4  |     | 194.1       | LD_C        | 400         |             |
| -18.4  |     | 194.1       | LD_C        | 350         | 0.25        |
| -18.4  |     | 194.1       | LD_C        | 300         |             |
| -18.4  |     | 194.1       | LD_C        | 250         | 0.16        |
| -18.4  |     | 194.1       | LD_C        | 200         | 0.35        |
| -18.4  |     | 194.1       | LD_C        | 150         | 0.24        |
| -18.4  |     | 194.1       | LD_C        | 100         | 0.17        |
| -18.4  |     | 194.1       | LD_C        | 50          | 0.16        |
| Temp | RH | LD | LD| 0.39 |
|------|----|----|----|------|
| -18.4| 194.1| LD_C | 10 | 0.35 |
| -18.4| 194.1| LD_C | 5  | 0.39 |
| -18.42| 197 | 14 | 500 | 0.59 |
| -18.42| 197 | 14 | 450 | 0.28 |
| -18.42| 197 | 14 | 400 | 0.34 |
| -18.42| 197 | 14 | 350 | 0.29 |
| -18.42| 197 | 14 | 300 | 0.27 |
| -18.42| 197 | 14 | 250 | 0.49 |
| -18.42| 197 | 14 | 200 | 0.27 |
| -18.42| 197 | 14 | 150 | 0.31 |
| -18.42| 197 | 14 | 100 | 0.32 |
| -18.42| 197 | 14 | 80  | 0.31 |
| -18.42| 197 | 14 | 30  | 0.21 |
| -18.42| 197 | 14 | 5   | 0.46 |
| -18.27| 200 | 15 | 500 | 0.48 |
| -18.27| 200 | 15 | 450 | 0.40 |
| -18.27| 200 | 15 | 400 | 0.26 |
| -18.27| 200 | 15 | 250 | 0.25 |
| -18.27| 200 | 15 | 200 | 0.40 |
| -18.27| 200 | 15 | 150 | 0.47 |
| -18.27| 200 | 15 | 100 | 0.28 |
| -18.27| 200 | 15 | 80  | 0.37 |
| -18.27| 200 | 15 | 50  | 0.34 |
| -18.27| 200 | 15 | 30  | 0.20 |
| -18.27| 200 | 15 | 10  | 0.31 |
| -18.27| 200 | 15 | 5   | 0.31 |