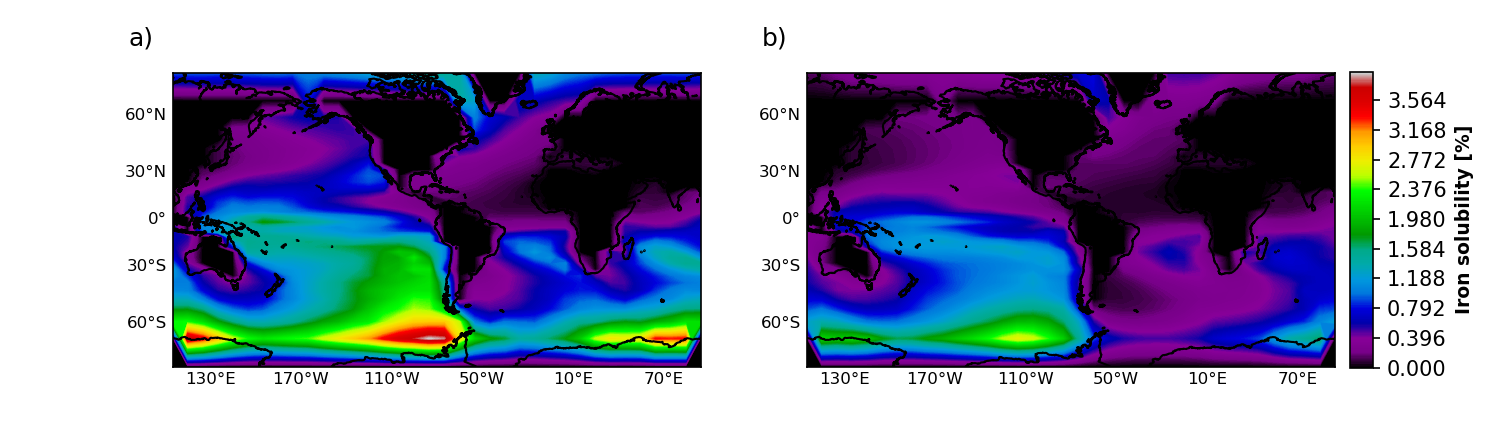
**Figure x:** Averages of Fe aerosol solubility fields contained in the dust, a) for the Holocene and b) for LGM.

The figure x shows the percentage averages of the amount of iron solubilized concerning the total iron load contained in the Holocene and the LGM dust flux. These fields were estimated from averages at each grid point of the 6 solubility fields for each previously calculated period, these last using the methodology set out in section 2.3.

From laboratory work (Baker et al., 2006, Baker et al., 2006a and Baker et al., 2006b), we know that iron soluble in mineral aerosol has an inverse relationship with the concentration of wind dust. It only takes into account the physical effect between the distance to the source as an indicator of how long the dust particles remain in suspension and how this affects the grain morphology and its mineral composition, therefore, indicating the surface exposed to being easily solubilized. The above, without considering previous processes such as origin solubility, product of source mineralogy, transport effects, such as cloud acidity or photochemical reactions, and/or deposition processes, such as chemical reactions (water pH, oxidation, temperature) or organic (organic complexion with ligands).

**Table 2:** Median Fe aerosol solubility for each experiment

| **Model/Region** | **Global** | **HNLC** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **NA** | **NP** | **CEP** | **SP** | **SAI** |
| PI | 0.485 | 0.357 | 0.281 | 1.012 | 1.719 | 0.936 |
| LGM | 0.239 | 0.181 | 0.141 | 0.626 | 1.1 | 0.433 |
| Albani PI | 0.421 | 0.31 | 0.256 | 0.54 | 2.035 | 1.001 |
| Albani LGM | 0.185 | 0.188 | 0.097 | 0.552 | 0.596 | 0.243 |
| Lambert PI | 0.185 | 0.203 | 0.14 | 0.624 | 0.443 | 0.412 |
| Lambert LGM | 0.112 | 0.101 | 0.068 | 0.407 | 0.164 | 0.340 |
| Ohgaito PI | 0.562 | 0.415 | 0.304 | 1.219 | 2.823 | 1.508 |
| Ohgaito LGM | 0.202 | 0.171 | 0.111 | 0.752 | 0.866 | 0.357 |
| Takemura PI | 0.546 | 0.425 | 0.451 | 0.992 | 1.440 | 1.076 |
| Takemura LGM | 0.431 | 0.222 | 0.364 | 0.622 | 1.354 | 1.281 |
| MIROC-ESM PI | 0.529 | 0.365 | 0.322 | 1.069 | 2.335 | 1.180 |
| MIROC-ESM LGM | 0.310 | 0.185 | 0.156 | 0.631 | 2.527 | 1.750 |
| MRI-CGCM3 PI | 0.34 | 0.28 | 0.231 | 0.936 | 1.448 | 0.579 |
| MRI-CGCM3 LGM | 0.276 | 0.263 | 0.163 | 0.756 | 1.514 | 0.493 |

**Table 2x:** Mean Fe aerosol solubility for each experiment

| **Model/Region** | **Global** | **HNLC** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **NA** | **NP** | **CEP** | **SP** | **SAI** |
| PI | 0.653 | 0.419 | 0.273 | 0.932 | 1.672 | 1.118 |
| LGM | 0.381 | 0.211 | 0.126 | 0.617 | 1.099 | 0.587 |
| Albani PI | 0.732 | 0.340 | 0.232 | 0.6 | 1.861 | 1.133 |
| Albani LGM | 0.271 | 0.184 | 0.085 | 0.626 | 0.529 | 0.278 |
| Lambert PI | 0.356 | 0.3 | 0.145 | 0.657 | 0.505 | 0.679 |
| Lambert LGM | 0.149 | 0.116 | 0.055 | 0.35 | 0.198 | 0.438 |
| Ohgaito PI | 0.987 | 0.486 | 0.290 | 1.175 | 3.683 | 2.037 |
| Ohgaito LGM | 0.345 | 0.192 | 0.114 | 0.726 | 0.825 | 0.366 |
| Takemura PI | 0.696 | 0.508 | 0.411 | 0.963 | 1.501 | 1.322 |
| Takemura LGM | 0.652 | 0.305 | 0.305 | 0.618 | 1.472 | 1.629 |
| MIROC-ESM PI | 0.772 | 0.436 | 0.304 | 1.035 | 2.393 | 1.403 |
| MIROC-ESM LGM | 0.760 | 0.224 | 0.143 | 0.597 | 2.672 | 2.055 |
| MRI-CGCM3 PI | 0.579 | 0.382 | 0.233 | 1.059 | 1.439 | 0.852 |
| MRI-CGCM3 LGM | 0.485 | 0.285 | 0.156 | 0.891 | 1.443 | 0.702 |

Therefore, given the higher dust load during the LGM the iron aerosol solubility reaches global maximum average values of 0.38% compared to the Holocene where they reach up to 0.65%. While the median is between 0.48% and 0.23%, for the Holocene and LGM, conversely. Although the solubility of Fe is considered to vary, preferentially, between 1 - 10%, for values only coming from the relationship between dust flux and time deposition, numerous works use global measures below or close to 1% (Tagliabue et al., 2016, Odalen et al., 2020, Lambert et al., 2021, Saini et al., 2022). The MIROC-ESM model (approximately 0.77% on average for both periods) shows the highest average values, except, although with high variability, Ohgaito which reaches ~1% during the Holocene and ~0.4% during the LGM. Regarding the median, during the Holocene, Takemura, Ohgaito and MIROC-ESM tend to have similar values, around 0.5%, while Lambert is the one that escapes from the average with 0.18% globally. However, during the LGM in all models there is much greater variability. The relationship between the models Ohgaito, Takemura and MIROC-ESM is not unexpected, Lambert et al., 2021 shows us that these models either do not count or tend to underestimate the source of dust at latitudes beyond 30°S and/or glaciogenic origin, which could provide greater heterogeneity. Nevertheless, although the Lambert model is the farthest from the average or median it has the best adjustment with the core datasets for the LGM. Regionally, the Eastern Central Pacific (CEP) along with the Southern Oceans (SO, South Pacific (SP) and South Indian Atlantic (SAI)) show the highest dissolved iron inputs, with medians of 1.01% (CEP), 1.71% (SP) and 0.93% (UPS) and 0.62% (CEP), 1.1% (SP) and 0.43% (UPS) during the Holocene and LGM, respectively. Since all models tend to reproduce CEP conditions well, it is the region with the best adjustment between models for both periods.

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La figura x, muestra los promedio porcentuales de la cantidad de hierro solubilizado respecto de la carga de hierro total contenido en el flujo de polvo del Holoceno y LGM. Éstos campos fueron construidos a partir de promedios en cada punto de grilla de los 6 campos de solubilidad de cada periodo estimado, éstos últimos calculados a partir de la metodología expuesta en la sección 2.3.

A partir de trabajos de laboratorio (Baker et al., 2006, Baker et al., 2006a and Baker et al., 2006b), sabemos que el hierro soluble en los aerosoles minerales tiene una relación inversa con la concentración de polvo eólico. La cual sólo toma en cuenta el efecto físico entre la distancia a la fuente como un indicador del tiempo que las partículas de polvo permanecen en suspensión y cómo esto afecta la morfología del grano y su composición mineral, por ende, es un indicador de la superficie que queda expuesta para ser fácilmente solubilizada. Lo anterior, sin considerar procesos previos como la solubilidad de origen, producto de la mineralogía de la fuente, efectos de transporte, como la acidez de la nube o reacciones fotoquímicas, y/o procesos de depositación, como reacciones químicas (PH del agua, oxidación, temperatura) u orgánicos (complejización orgánica con ligandos).

Por lo tanto, dada la mayor carga de polvo durante el UMG la solubilidad del hierro aerosol alcanza valores promedios máximos globales de 0.38% en comparación del Holoceno donde llegan hasta 0.65%. Mientras la mediana está entre 0.48% y 0.23%, para el Holoceno y LGM correspondientemente. Si bien, la solubilidad del Fe se considera que varía, preferentemente, entre 1 - 10%, para valores provenientes netamente de la relación flujo de polvo tiempo de depositación, numerosos trabajos utilizan medidas globales por debajo o cercanos a 1% (Tagliabue et al., 2016, Odalen et al., 2020, Lambert et al., 2021, Saini et al., 2022). El modelo MIROC-ESM (apróximadamente 0.77% en promedio para ambos periodos), muestra los mayores valores promedios, a excepción, aunque con mayor variabilidad, Ohgaito que alcanza un ~1% durante el Holoceno y ~0.4% durante el LGM. Respecto de la mediana, durante el Holoceno, Takemura, Ohgaito y MIROC-ESM tienden a tener valores similares, en torno a 0.5%, mientras Lambert es el que más se escapa de la media con 0.18% a nivel global, nos obstante, durante el LGM en todos los modelos hay mucha mayor variabilidad. La relación entre los modelos Ohgaito, Takemura y MIROC-ESM no es inesperada dado que Lambert etal., 2021 nos muestra que o no cuentan o tienden a subestimar la fuente de polvo en latitudes superiores a los 30°S y/o de origen glaciogénico, que podrían aportar mayor heterogeneidad. No obstante, si bien el modelo Lambert es el que más se aleja de la la media o mediana cuenta con el mejor ajuste con los datos de testidos para el LGM. Regionalmente, el Pacífico Central Este (CEP) junto con los Océanos del Sur (SO, Pacífico Sur (SP) y Atlántico Índico Sur (SAI)) muestran tener las mayores entradas de hierro disuelto, con medianas de 1.01% (CEP), 1.71% (SP) y 0.93% (SAI) y 0.62% (CEP), 1.1% (SP) y 0.43% (SAI) durante el Holoceno y LGM, respectivamente. Dado que todos los modelos tienden a reproducir bien las condiciones del CEP, es la región con mayor ajuste entre modelos para ambos periodos.