Do climate feedbacks in the tropical East Pacific impact emissions of biogenic halocarbons?

**Halocarbon production**

Halocarbon emission influence atmospheric processes such as formation of aerosols, ultra-fine particles, NOx, and NOy chemistry, and ozone chemistry. Proposed pathway of halocarbon production via dissolved organic matter (DOM) or direct emission from algae, and photosynthesis of CHJ. Chemical degradation products Br, and I, of halocarbon emissions take part in atmospheric chemistry.

**El Niño influenced oceanic emissions of halocarbons!**

- During the ENSO neutral year 2012, higher oceanic CHJ than CHBr was measured, while during the El Niño year 2015 sea surface CHBr largely exceeded lower CHJ.
- Higher emissions of CHBr and lower emissions of CHJ during El Niño along with less pronounced MABL heights led to larger atmospheric CHBr and slightly lower CHJ in October 2015.
- High iodocarbon emissions in 2012 contributed strongly to tropospheric iodine monoxide (IO).

**Open questions**

- Is the neutral / El Niño difference a recurring phenomenon?
- What causes the difference in oceanic halocarbons? E.g. phytoplankton speciation and DOM composition?
- How do varying emission scenarios during different ENSO phases influence tropospheric halogen chemistry?

**Sea-to-air fluxes**

Sea-to-air fluxes for December 2012 and October 2015:

- CHBr 131 (550-2201), CHJ 956 (21-4668) pmol h⁻¹ m⁻²
- CHBr 1588 (841-15488), CHJ 230 (22-2490) pmol h⁻¹ m⁻²
- October 2015 was 3.3 times lower for CHJ and 12.1 times higher for CHBr with moderate winds during both cruises (5.6 and 7.1 m s⁻¹, respectively).

**Oceanic halocarbons**

Seawater concentrations for December 2012 and October 2015 (mean (min – max)):

- CHBr 6.5 (0.2 – 21.5), CHJ 9.8 (1.1 – 35.4) pmol L⁻¹
- CHBr 20.1 (0.1 – 100.0), CHJ 2.7 (0 – 15.0) pmol L⁻¹
- October 2015 was characterized by 3 times higher CHBr and 3.6 times lower CHJ despite similar SST and CHI a.

Correlation of environmental parameters for December 2012 and October 2015 (bold numbers significant):

<table>
<thead>
<tr>
<th>Spearmans rank correlation</th>
<th>CHBr</th>
<th>CHJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>SST</td>
<td>-0.52/-0.45</td>
<td>-0.29/-0.39</td>
</tr>
<tr>
<td>CHI a</td>
<td>0.73 / 0.22</td>
<td>0.48 / 0.13</td>
</tr>
<tr>
<td>DOM</td>
<td>0.48 / 0.84</td>
<td>-0.06 / -0.39</td>
</tr>
<tr>
<td>CHBr 3</td>
<td>0.66 / 0.37</td>
<td></td>
</tr>
</tbody>
</table>

**References**

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