Zooplankton can iron-fertilise the ocean

**Fe-flux through krill:**

- **Diatoms**
- **Lithogenic particles**
- **Predators**
- **Copepods**
- **Microbes**
- **Coprophages**
- **Ligands**
- **Faeces**

**Antarctic krill**

- **100-500 million tonnes**

**Background**

- Lack of Fe limits PP
- Most Fe in particulate form

**Zooplankton gut**

- Mechanical impact, low pH (~5.4), low oxygen, enzymes
- Recycling of biogenic Fe
- Mobilisation of lithogenic Fe
- Release of Fe-binding ligands

**DFe release**

- Via multiple pathways
- Fecal pellets

**Iron mobilisation and recycling by krill can boost the SG bloom.**

- Bloom duration ↑
- Spatial extent ↑
- Nutrient-stress ↓
- Photosynthetic efficiency ↑

**South Georgia:**

Interannual variability in bloom extent and krill abundance

Fertilisation > Grazing losses

Grazing losses > Fertilisation

**South Georgia:**

- Interannual variability in bloom extent and krill abundance

Fe-flux through krill:

**Slope values for regressions between median Chl a and krill abundance**

- **Southern Ocean**
- **South Georgia**

**y = -31.056x + 11.356**

**R² = 0.5182**

**y = -35.148x - 3.2392**

**R² = 0.6747**

**ΔfCO₂ (sea-air) (µatm)**

**Southern Ocean**

**South Georgia**

**Chl a**

(data: Kitidis/ SOCAT)
Identification of plankton communities at SAHFOS

**Continuous Plankton Recorder (CPR)**
- underway phyto- & zooplankton sampling
- large spatial coverage at no extra ship time
- analysis of ~150 samples wk⁻¹ (~3000 nmi)
- FlowCam® Macro for volume measurements
- platform for sensors, water sampler

**Southern Ocean taxonomy**
- statistical analysis and modelling
- isolation of individual species, tissues, fecal pellets

**Skills**

**Information**
- size spectrum
- diatoms vs coccolithophores
- phyto- vs zooplankton
- indicator species
- ‘recycling’ vs ‘export’ communities
- carbon stock

for interpretation of pCO₂ data, satellite chl a etc.

**Data**

10 Year time-series
Falkland Is. - South Georgia
- 78 transects 2005-2016
- regional, seasonal & interannual changes in the plankton community
- carbon stock associated with different plankton communities