The response of the So. Ocean system is non-uniform, perhaps due to

1) variable Fe,
2) variable initial conditions, or
3) variable environmental forcing.

Here, we compare similarities and differences between KEOPS, CROZEX, So. Georgia and the BWZ sites.

HOW DOES FE IMPACT FOODWEB.

THE RESPONSE IS NON UNIFORM.
(Variable Fe or variable to conditions or variable forcing)

Common features.

~~What response~~ of HNLC adjacent, amount there, Fe (or Fe+SBER)
BLOOM, higher ex, Si removal, DIC rem, NO_3, DIATOMS
(obvious but some don't), evidence of iron supply, enhanced remin in Fe ct cont.
lower η e ratios, change seed popn, ends conds, Fe level, Si

LAT (Fe / setting)

Variable features — CIRCLN / Fe supply / BATHYM.
Fe supply / Grazing / PULSED vs CONTINUOUS

Timing, Magnitude, size, length, dominant species, setting (advection vs stack).

Sized response of ~~feature~~ common features. meso zooplankton. Depth.

INT. SIZE OF EXPORT OVER SEASON
~~...~~ (Fe / Forcing / Methods / Setting) ~~...~~

Neritic / open ocean

Don't know
→
~~SE CHL~~ knowledge that ~~...~~ doesn't exist yet
~~MESO ZOO RESPONSE~~
RATE OF EXPORT AT BLOOM PEAK. (TM OTHER THAN FE — NATURE OF Fe — GRAZING — TAX PREF)
→ ~~...~~
SPOT knowledge that exists but we haven't read paper
(special issue of SE in Review)
SI REM EVERYWHERE?

Day/expt.
CROZ
KERG
SG
Bio
CONT + Fe

(COOK BOOK)
SCIENCE
INT + E-RATIO OVERTIME

Objective : How iron affects the pelagic food web ?

The biological response to iron. fertilization is not uniform (comparison among Crozex, Keops and South Georgia) ; variability could be due to variable Fe-addition, initial conditions and environmental forcing)

Common features, but variable extent		
	Enhanced phytoplankton biomass than HNLC	
	Higher export than HNLC	
	Silicon removal	
	Utilization of nitrate	
	DIC removal	
	diatoms	
	Evidence of iron. supply	
	Thorium excess	What depth of intégration ?
	Lower e-ratios	
	Higher remineralization	
Variable features	Timing of bloom	latitutde
	Magnitude of bloom (phytoplankton biomass)	Fe-setting
	Size of bloom (spatial extent)	Circulation, Fe-supply, bathymetry
	Length of bloom	Fe-supply, pulse vs continuous, remineralization
	Dominant phytoplankton species	Seed population encounters cond of Fe and Si level
	mesozooplankton	Neritic vs open ocean
	Extent of Seasonal export	
We don't know		
Known unknowns		
	Importance of other trace metals or vitamins limitating growth	
	Bioavailability of Fe	
	Selective grazing for shaping the phytoplankton community	
What should be measured ?		
cookbook		

Similarities between natural fertilization areas appear to be as follows:

In all systems compared,

1) stratification of the system with Fe present leads to bloom initiation, and
2) we see DIC/modest NO3 drawdown.
3) We also see enhanced remineralization and
4) higher export compared to non-bloom HNLC sites.

The enhanced remineralization between systems was a particularly surprising similarity.

Differences between systems were found because of

1) latitudinal differences in light availability causing differences in the timing of the bloom.
2) The magnitude and spatial extent of the bloom may be affected by the amount of Fe supplied and whether the system is advective or retains the phytoplankton in an area.
3) The duration of the bloom differed, related to the timing and amount of Fe infusions.
4) It seems that the amount of export varied between systems because of the species that responded to the bloom (diatoms/phaeo) and the duration of the bloom.
5) The dominant species of phytoplankton may have varied because of seed population differences, Fe level, Si level, and light levels, differential grazing pressures (selective grazing).
6) Different mesozooplankton communities developed in the different sites.

Unknown Unknowns:

1)We don’t know much about the microbial loop linkages to higher trophic levels through the microzooplankton, or the selective grazing pressures shaping the phytoplankton community.

2) We don’t know which species of phytoplankton are most responsible for export of carbon.

3)We need to have a common integration depth and need to have a common method of calculating export.

4)We don’t know if other elements or vitamins might be co-limiting, affecting the composition of the phytoplankton community and therefore the transfer of carbon up the food web or to export/remineralization processes.

5)We don’t know how the rate of input of Fe conditions the structure of the community, in terms the growth rates of the community.