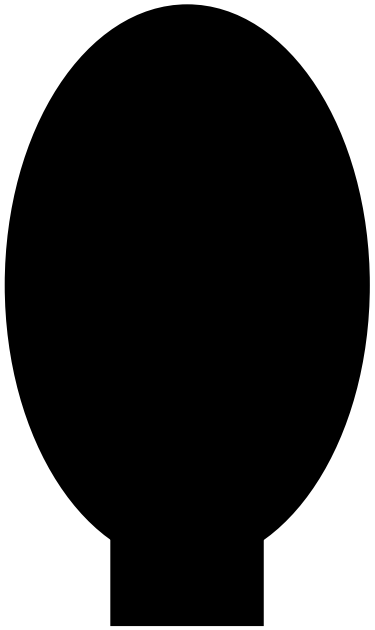
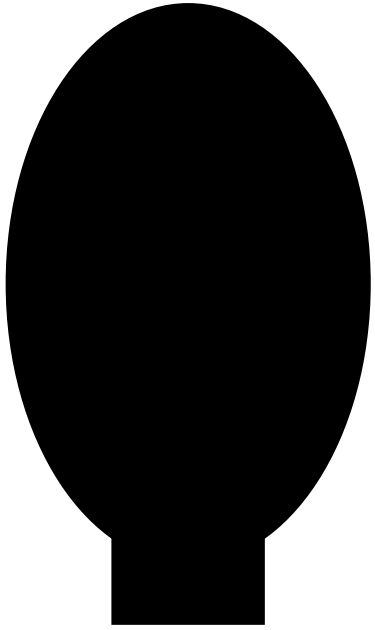
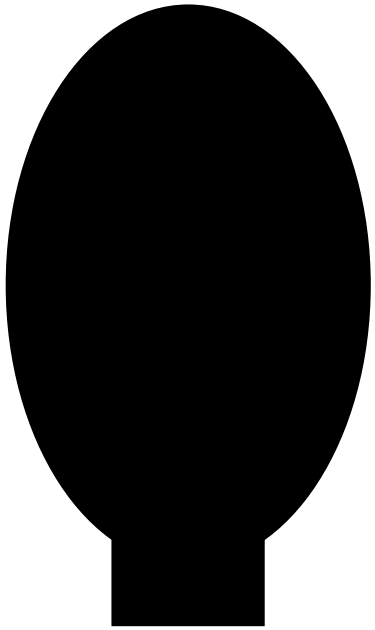
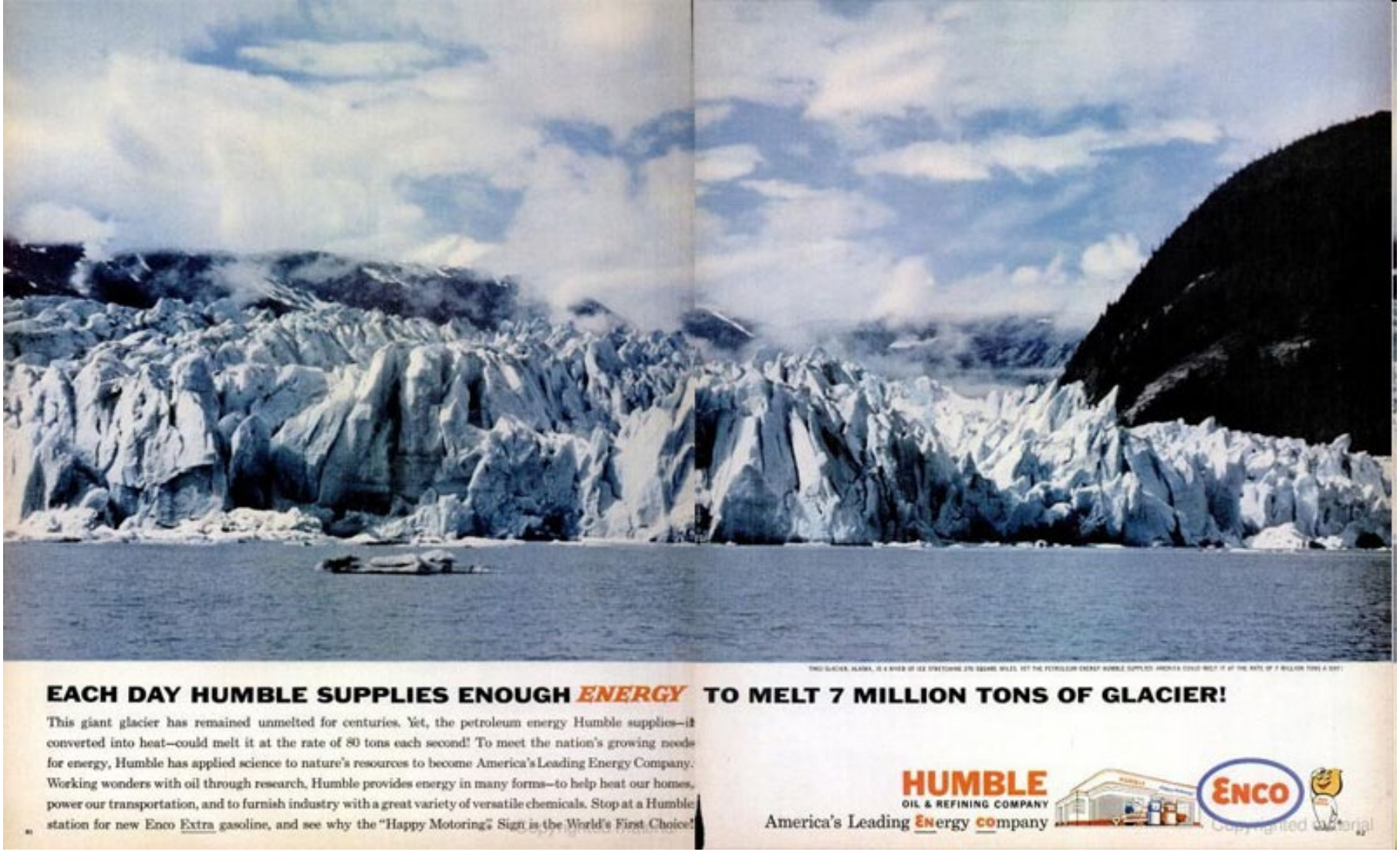








The 7 million tons is just the thermal energy from combustion. The retained solar energy is having its effect over the residence time of CO_2.

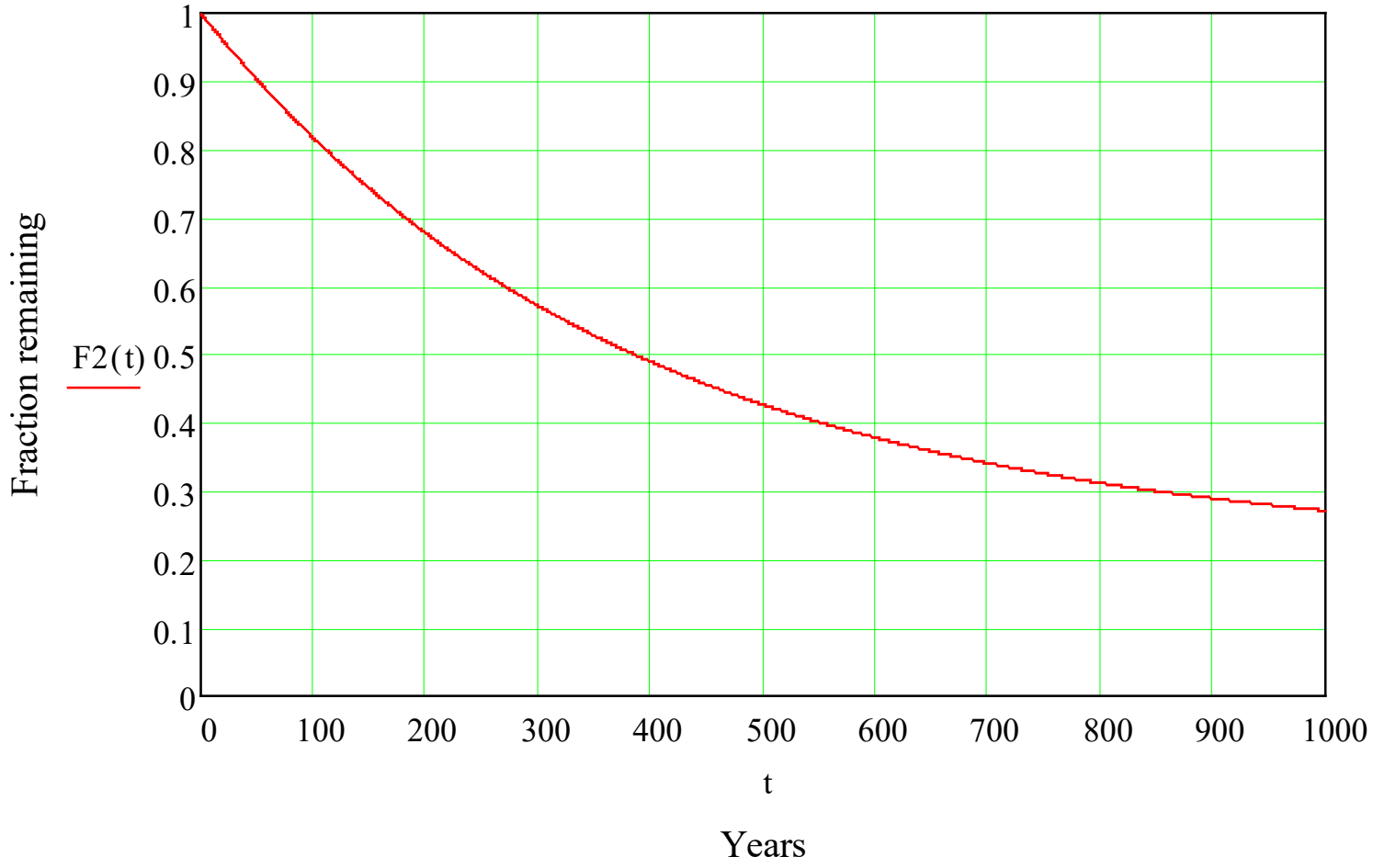
Humble is a small town in Texas. Now they call themselves Exxon.

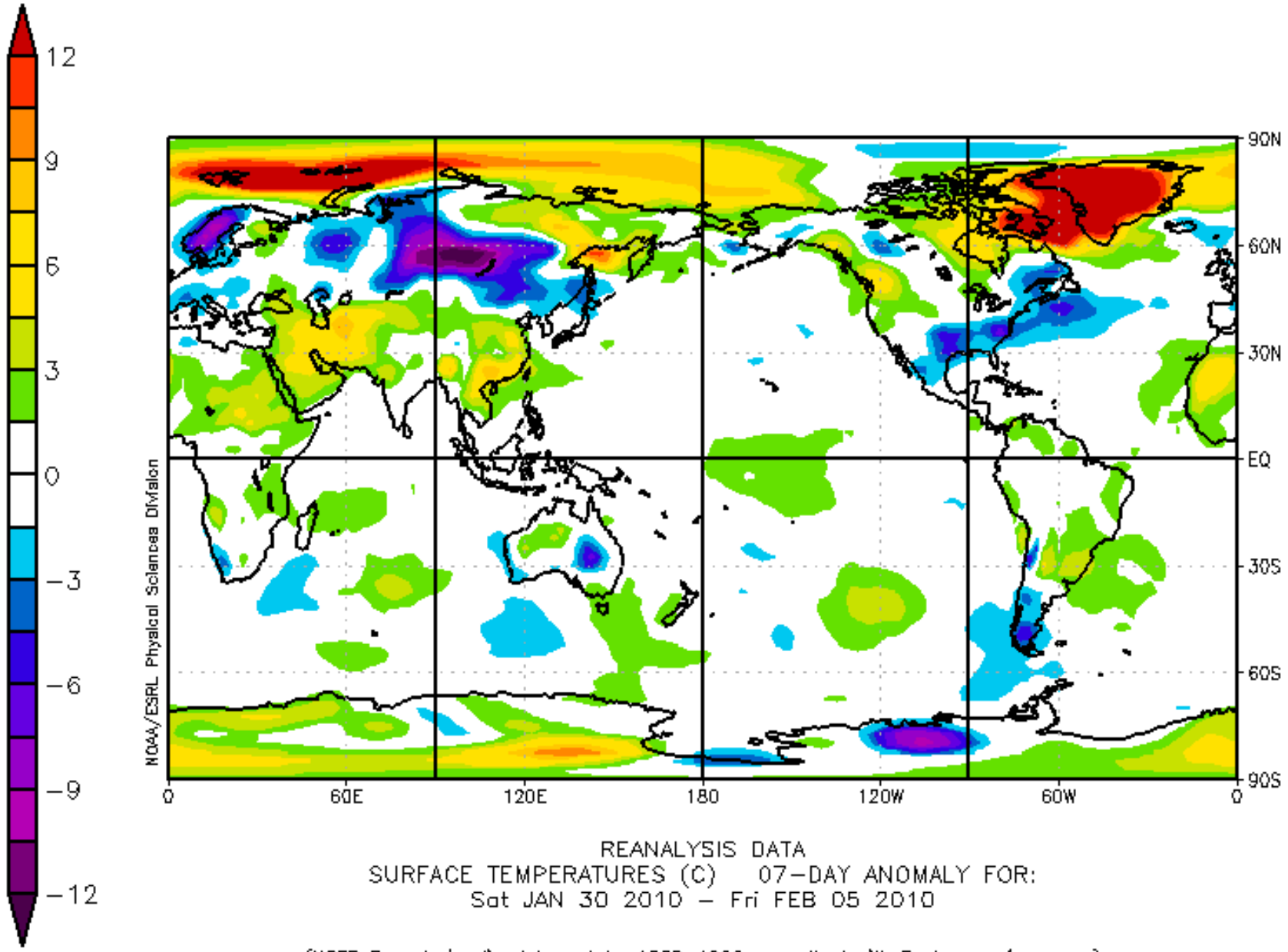
From Life Magazine 1962.

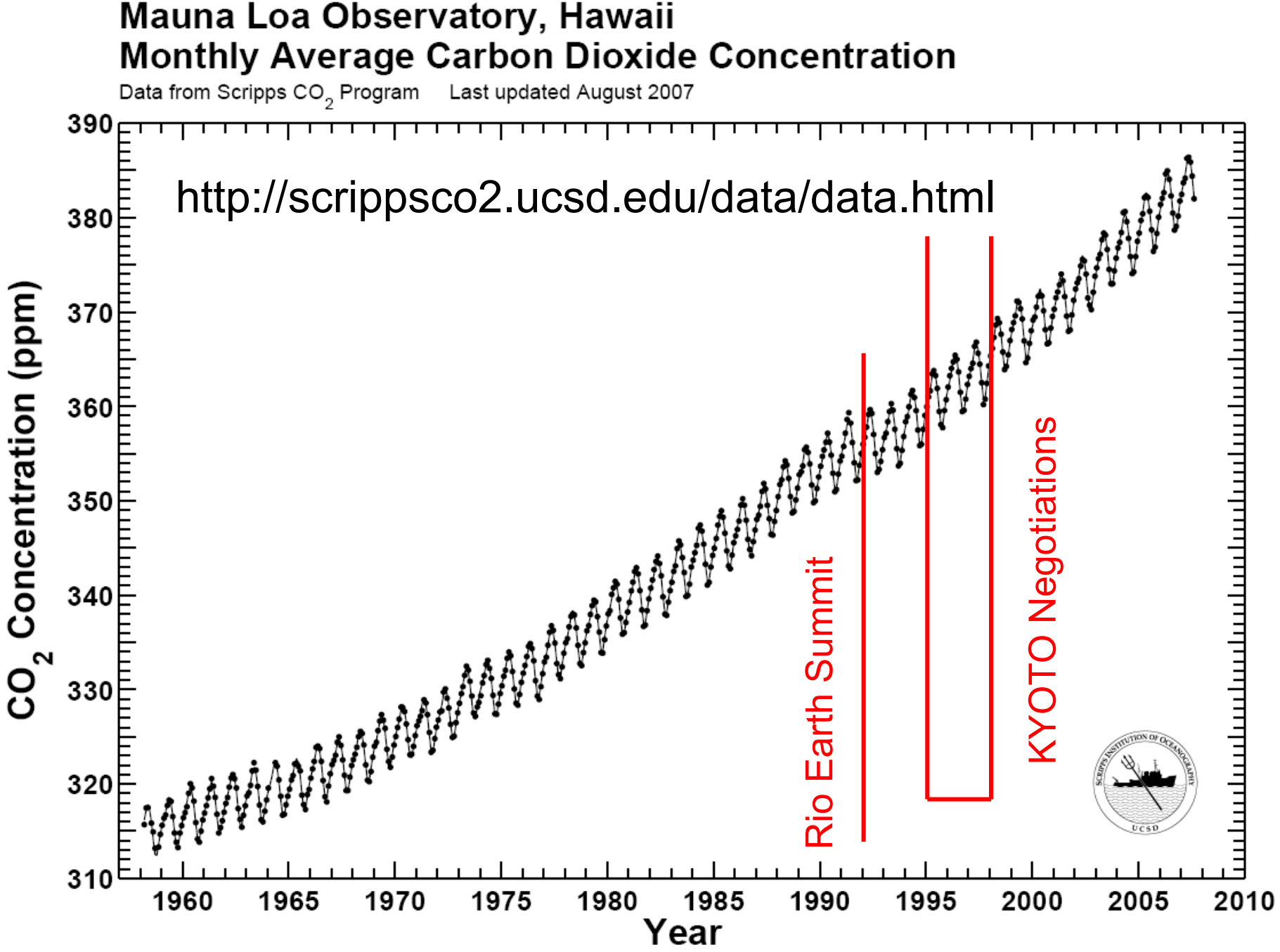
David Archer

http://www.agu.org/journals/gl/v024/i004/97GL00168/97GL00168.pdf

$$F2(t) := 0.75 \cdot e^{\frac{-t}{365}} + 0.135 \cdot e^{\frac{-t}{5500}} + 0.035 \cdot e^{\frac{-t}{8200}} + 0.08 \cdot e^{\frac{-t}{200000}}$$




12
9
6
3
0
−3
−6
−9
−12
NOAA/ESRL Physical Sciences Division
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
REANALYSIS DATA
SURFACE TEMPERATURES (C) 07-DAY ANOMALY FOR:
Sat JAN 30 2010 - Fri FEB 05 2010
(NCEP Reanalysis climatology data: 1968-1996, smoothed with 5-day running mean)


Mauna Loa Observatory, Hawaii
Monthly Average Carbon Dioxide Concentration
Data from Scripps CO2 Program Last updated August 2007
http://scrippsco2.ucsd.edu/data/data.html
CO2 Concentration (ppm)
390
380
370
360
350
340
330
320
310
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year
Rio Earth Summit
KYOTO Negotiations
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UCSD

POSITIVE FEEDBACKS

Loss of Arctic ice cover.

Methane from permafrost. x73 effect of CO_2

Lower solubility of CO_2 in sea water.

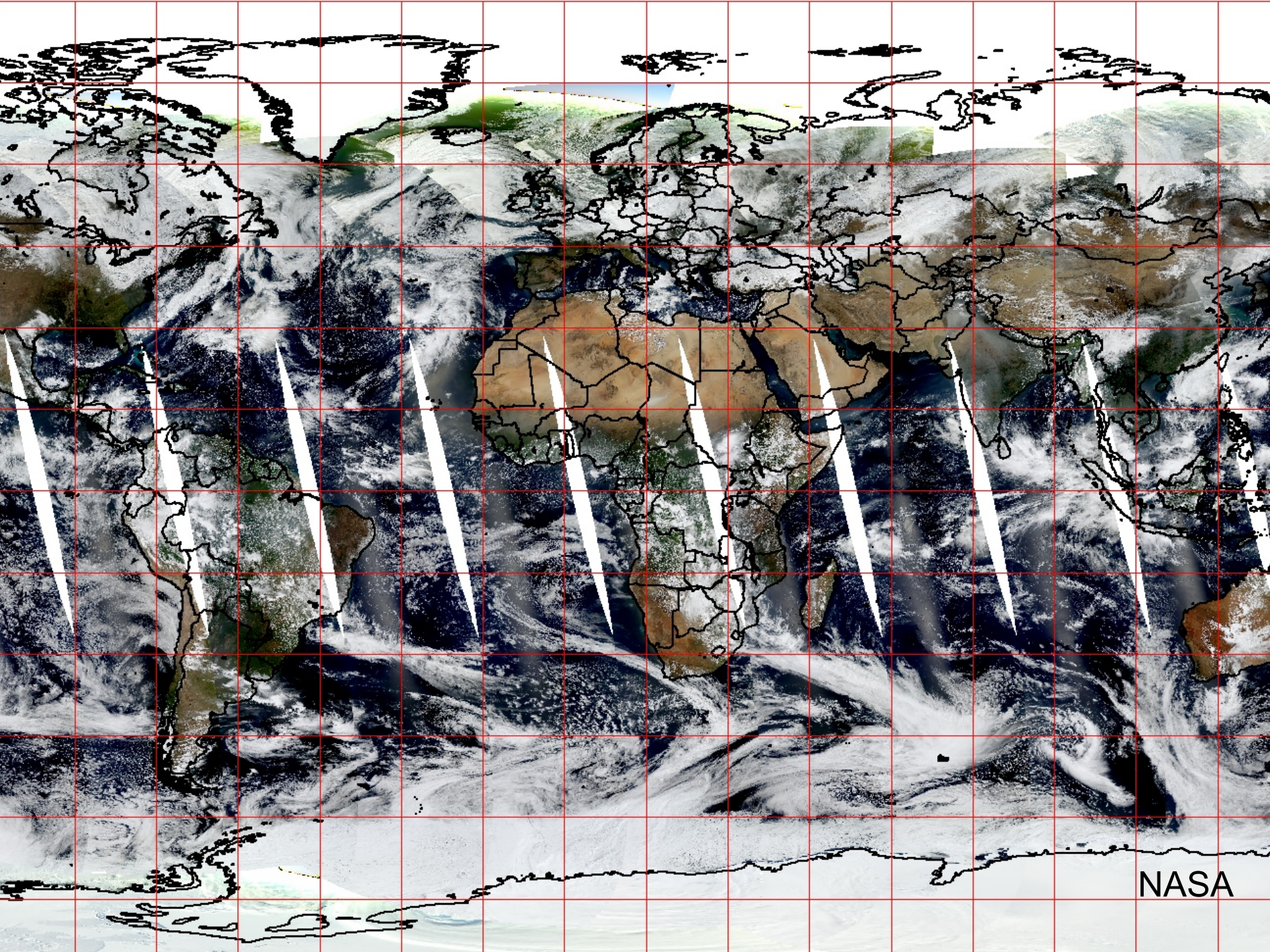
Fewer phytoplankton to make dimethyl sulphide.

More water vapour in the atmosphere.

Bush fires in Amazon basin.

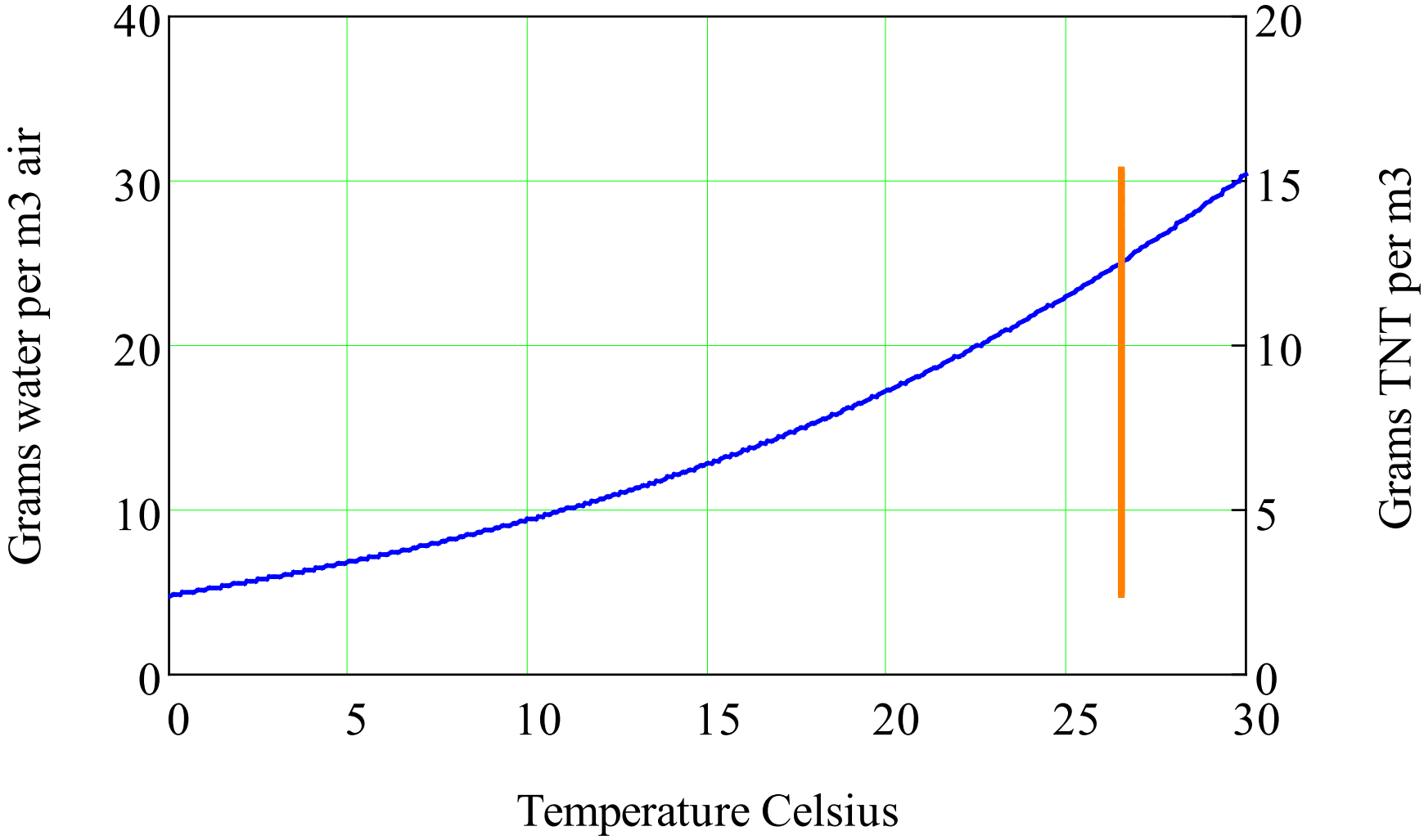
9 billion population with higher expectations.

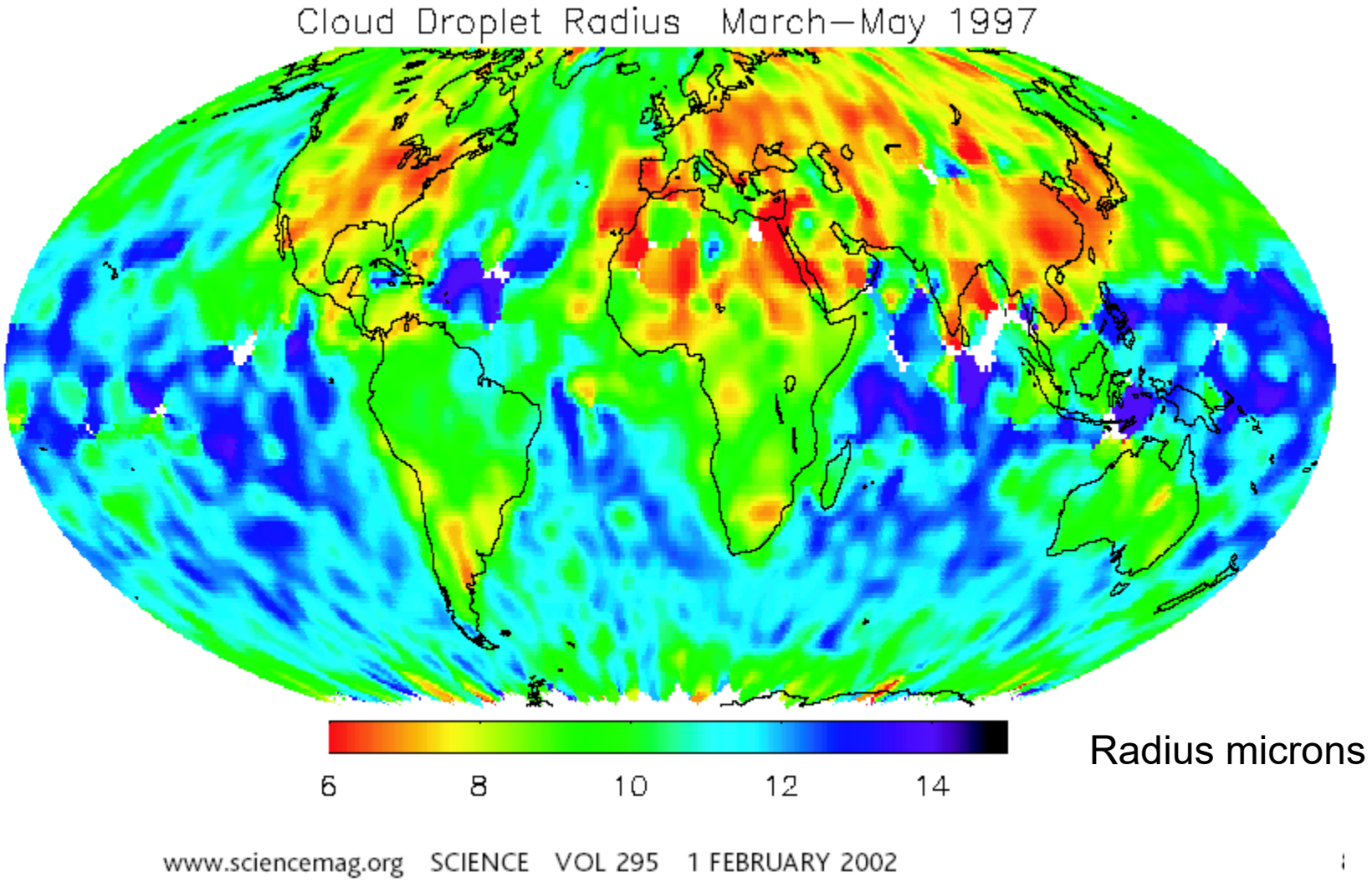
Total failure of CO_2 trading. . . . so far.


NASA


NASA

Mass of water vapour in air as a function of temperature





Breon FM Tanre D Generoso S Aerosol effect on cloud droplet size monitored from satellite.

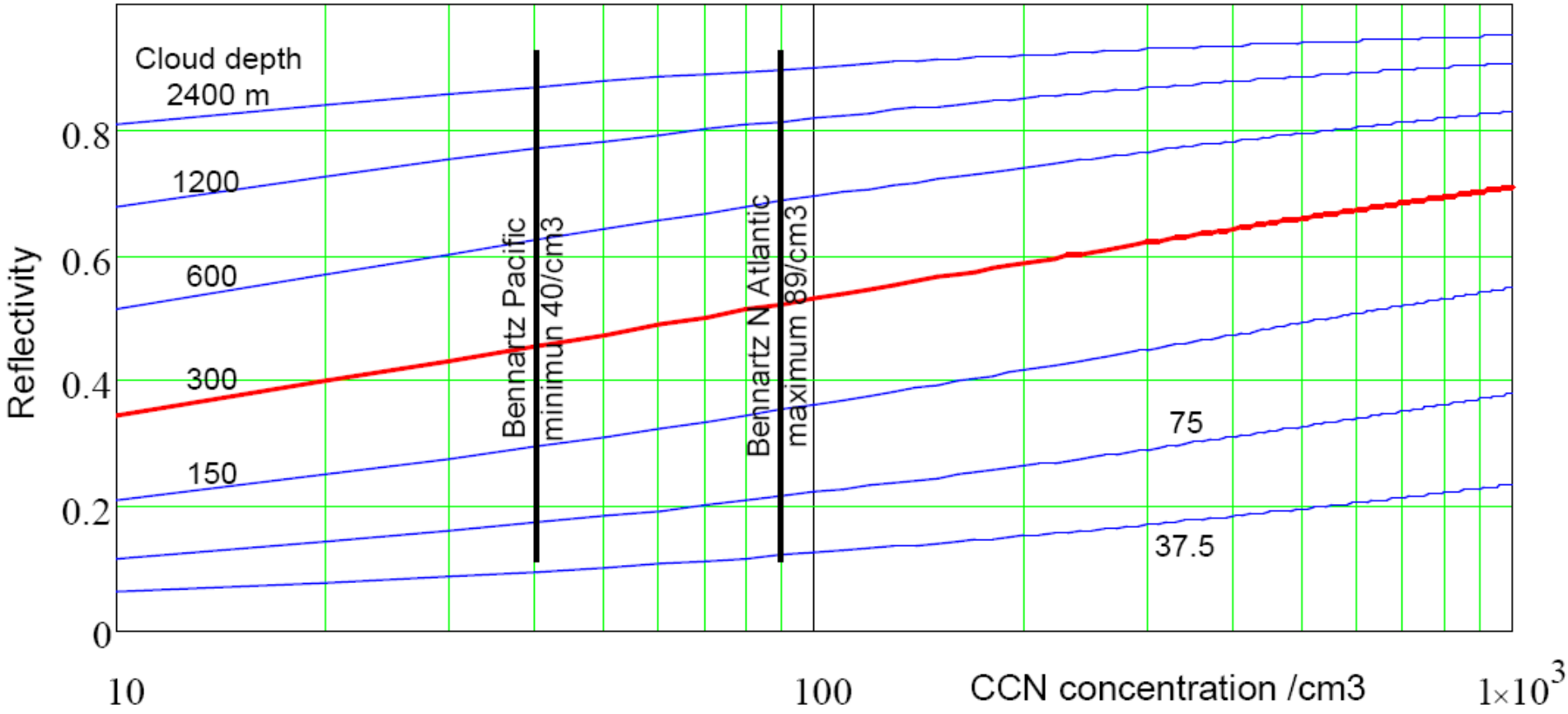

8 11:23 AM
Sean Twomey

Z = Cloud depth metres
L = Liquid water content gm/cubic metre
N = Cloud condensation nuclei /cubic cm.
A = Albedo

$$A(Z, L, N) := \frac{0.15 \cdot Z \cdot L^{\frac{2}{3}} \cdot n^{\frac{1}{3}}}{0.15 \cdot Z \cdot L^{\frac{2}{3}} \cdot n^{\frac{1}{3}} + 0.827}$$

B

For the same mass of water, lots of small drops are whiter than a smaller number of big ones.



$$\Delta \text{ Rct} = 0.075 \, \Delta \log_e \text{Ncd}$$

Or 2 times Ncd = + 0.058 reflection

From Schwarz and Slingo 1996

Nature 1990.

John Latham suggests increasing the number of condensation nuclei by spraying submicron drops of sea water.

Nature 1990.

John Latham suggests increasing the number of condensation nuclei by spraying submicron drops of sea water.

Fast evaporation - milliseconds

Nature 1990.

John Latham suggests increasing the number of condensation nuclei by spraying submicron drops of sea water.

Fast evaporation - milliseconds

Salt residues are ideal hydrophilic nuclei

Nature 1990.

John Latham suggests increasing the number of condensation nuclei by spraying submicron drops of sea water.

Fast evaporation - milliseconds

Salt residues are ideal hydrophilic nuclei

Turbulence spreads them evenly through the marine boundary layer.

Nature 1990.

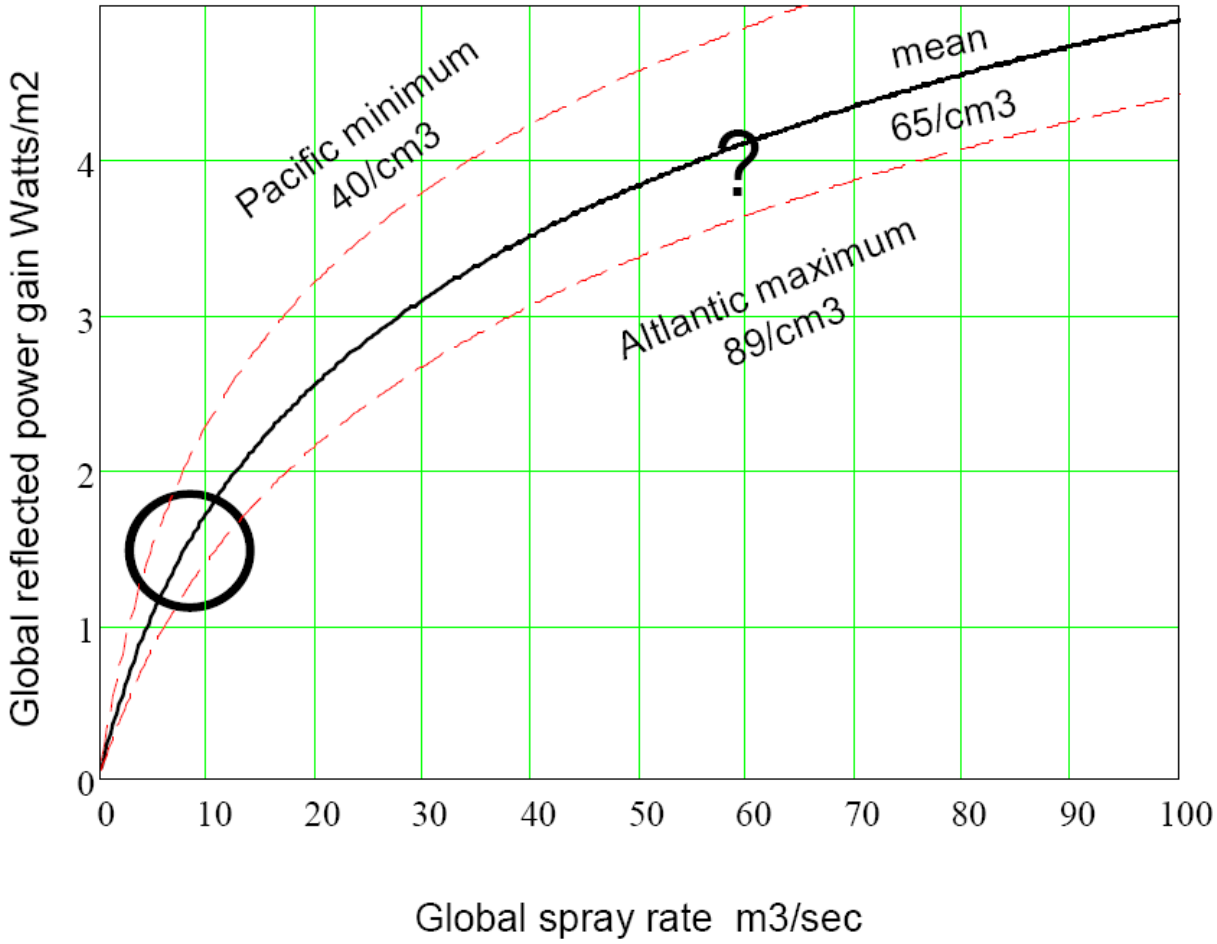
John Latham suggests increasing the number of condensation nuclei by spraying submicron drops of sea water.

Fast evaporation - milliseconds

Salt residues are ideal hydrophilic nuclei

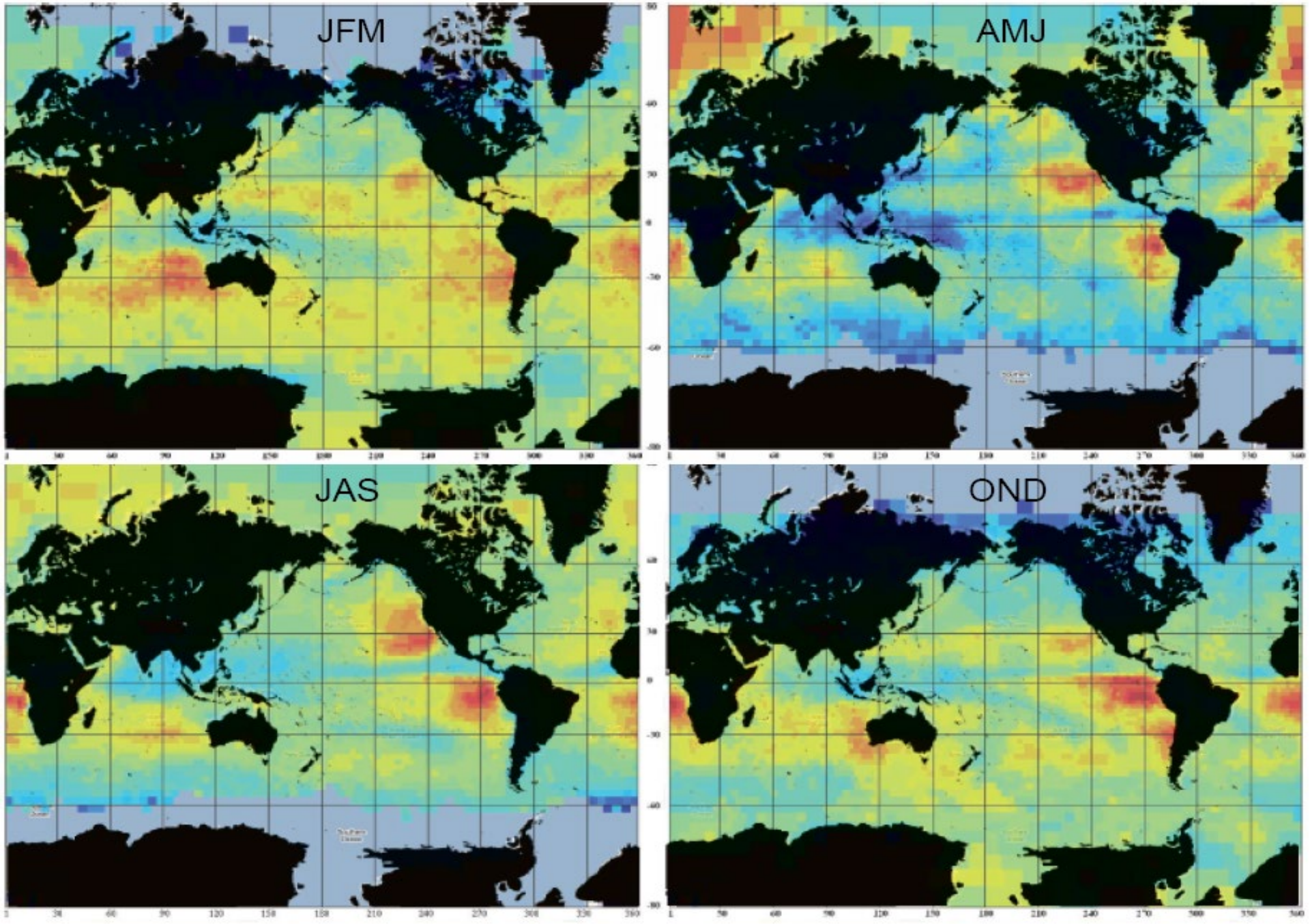
Turbulence spreads them evenly through the marine boundary layer.

Typically one 25 micron drop makes 2 drops each 19.8 microns in diameter.



Assumptions and sources

Boundary layer depth	1000m
Cloud depth	300 m
	Schwartz and Slingo (1996)
Liquid water	0.3mL/m3
	Schwartz and Slingo (1996)
Drop Life	59 hours
	Smith (1991)
Low not high cloud fraction	0.18
	Charlson et al. (1987)
Initial albedo	0.5
24 hour power in	340 W/m2


JFM
AMJ
JAS
OND

Clean, mid-ocean air far from shipping lanes.

Clean, mid-ocean air far from shipping lanes.

Migration with the seasons.

Clean, mid-ocean air far from shipping lanes.

Migration with the seasons.

Locally available energy.

Clean, mid-ocean air far from shipping lanes.

Migration with the seasons.

Locally available energy.

Long periods on duty.

Clean, mid-ocean air far from shipping lanes.

Migration with the seasons.

Locally available energy.

Long periods on duty.

Food, water, medical attention, home leave?

Clean, mid-ocean air far from shipping lanes.

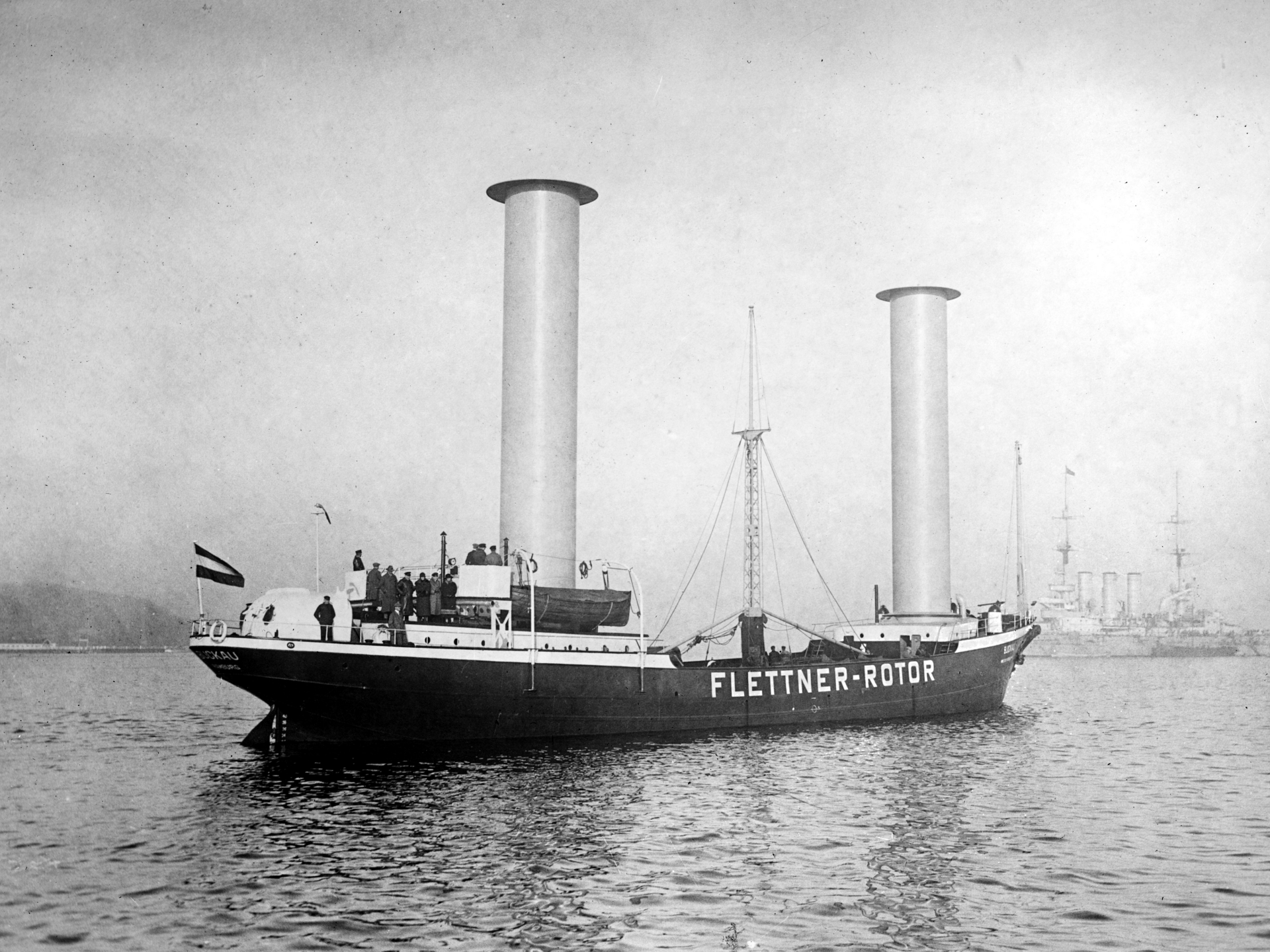
Migration with the seasons.

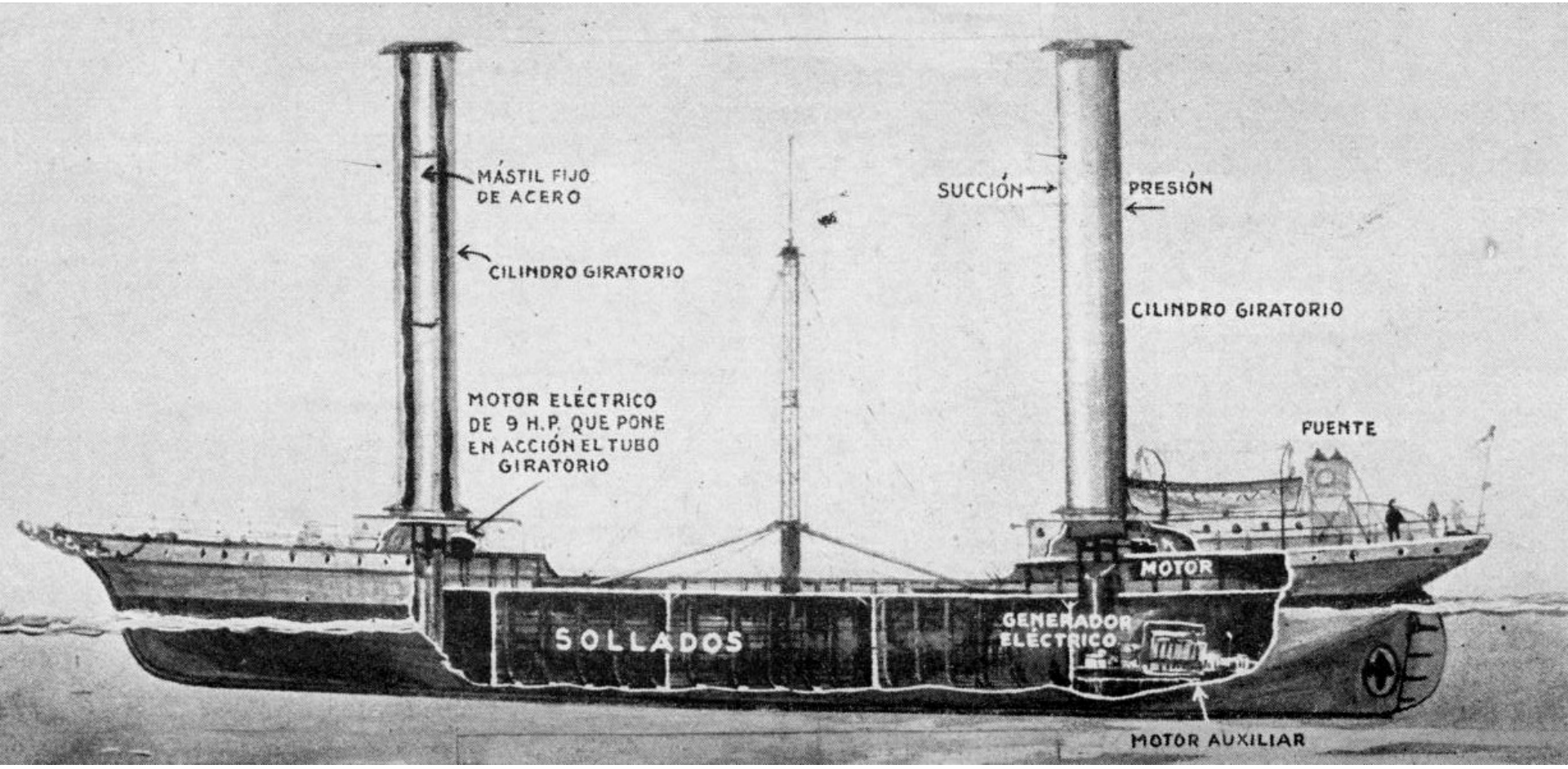
Locally available energy.

Long periods on duty.

Food, water, medical attention, home leave?

Unmanned sailing vessels with GPS and satellite communications.


FLETTNER-ROTOR


MÁSTIL FIJO
DE ACERO
CILINDRO GIRATORIO
MOTOR ELÉCTRICO
DE 9 H.P. QUE PONE
EN ACCIÓN EL TUBO
GIRATORIO
SUCCIÓN
PRESIÓN
CILINDRO GIRATORIO
FUENTE
MOTOR
SOLLADOS
GENERADOR
ELÉCTRICO
MOTOR AUXILIAR

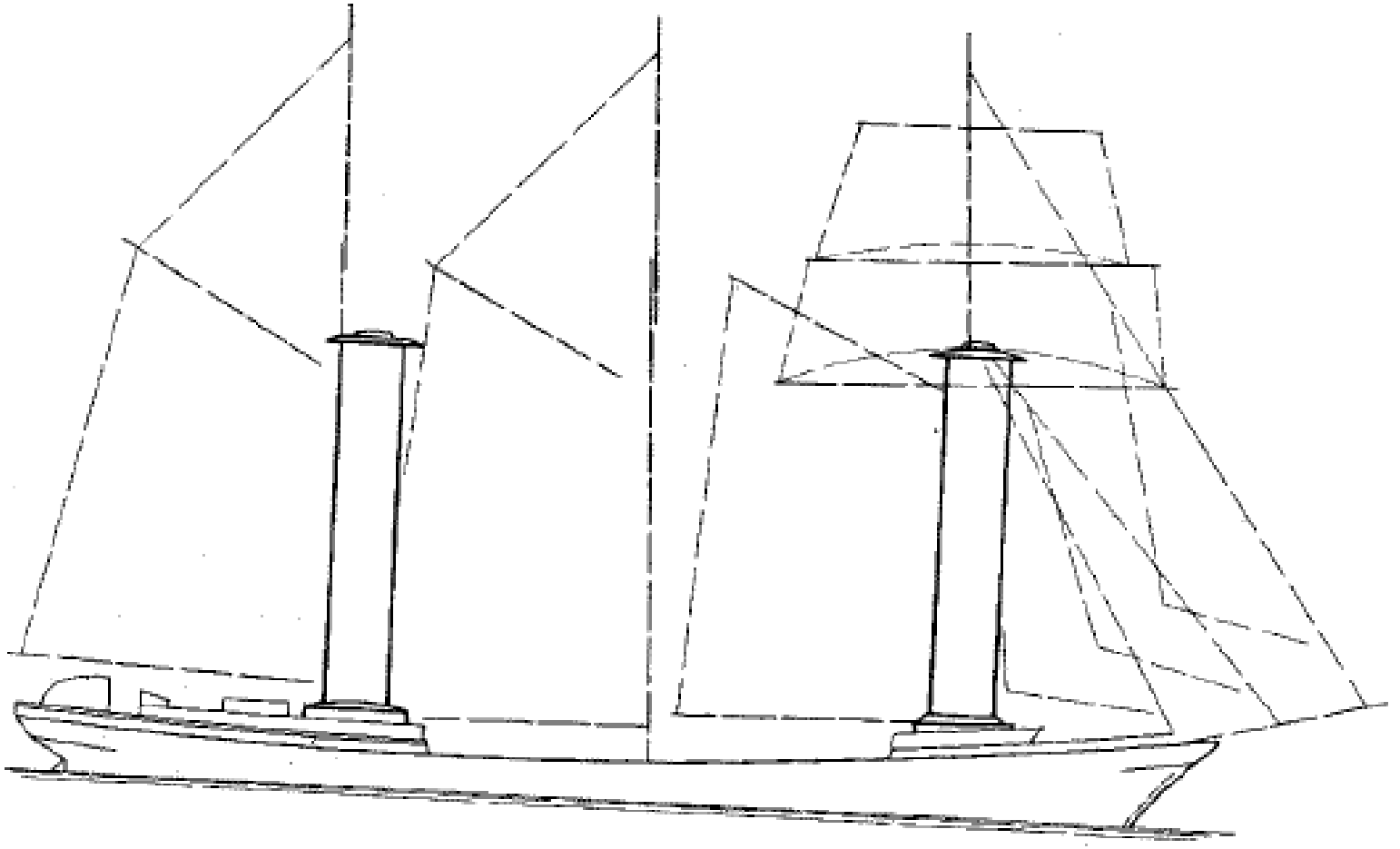


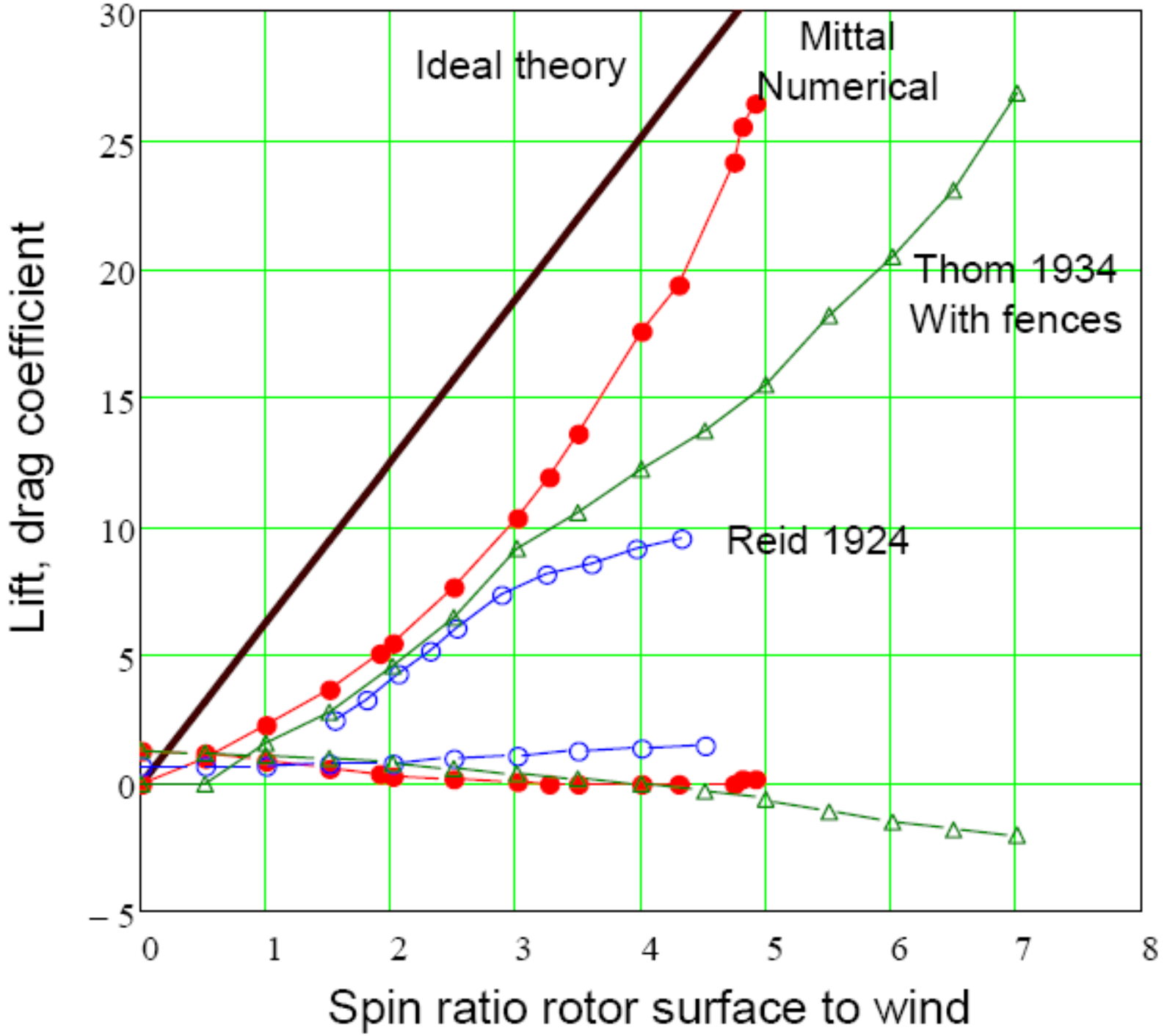
Fig. 29. Segelriß der „Buckau“ vor und nach dem Umbau.

DIE NATURWISSENSCHAFTEN

Dreizehnter Jahrgang | 6. Februar 1925 | Heft 6

Magnuseffekt und Windkraftschiff[1]).

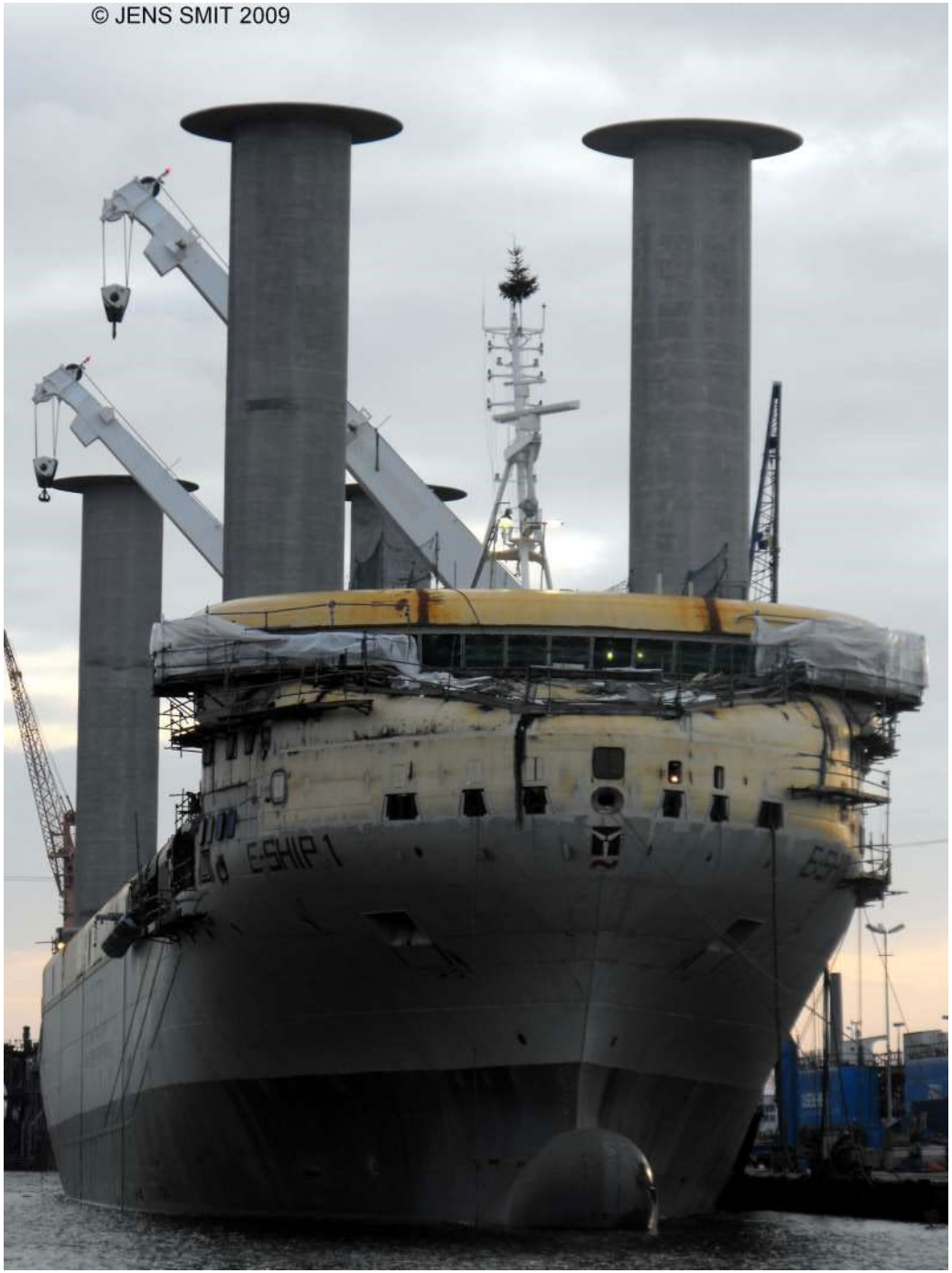
Von L. PRANDTL, Göttingen.


Ideal theory
Mittal
Numerical
Thom 1934
With fences
Reid 1924
Lift, drag coefficient
Spin ratio rotor surface to wind
30
25
20
15
10
5
0
– 5
0
1
2
3
4
5
6
7
8

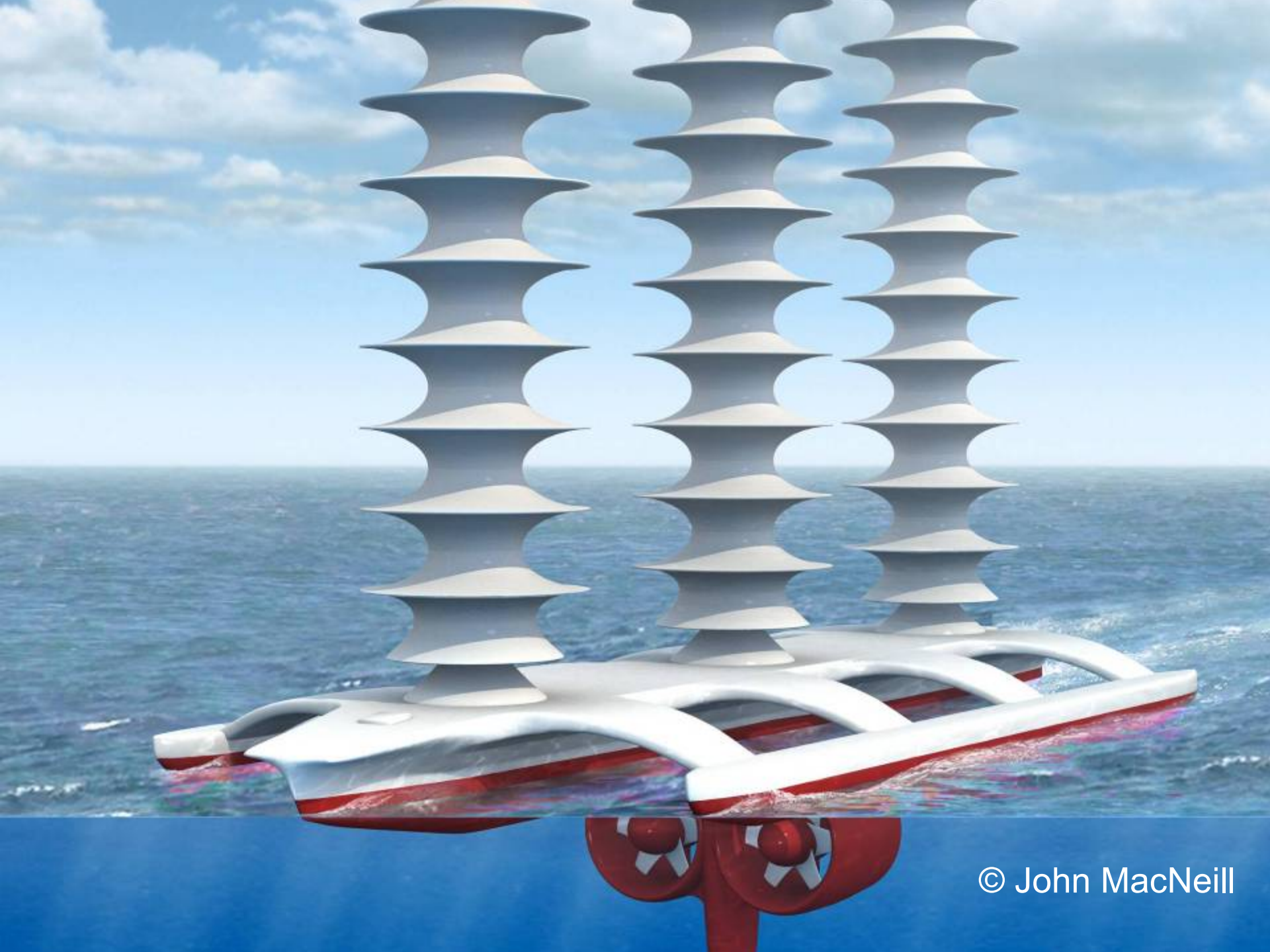

SEARUNNER 40

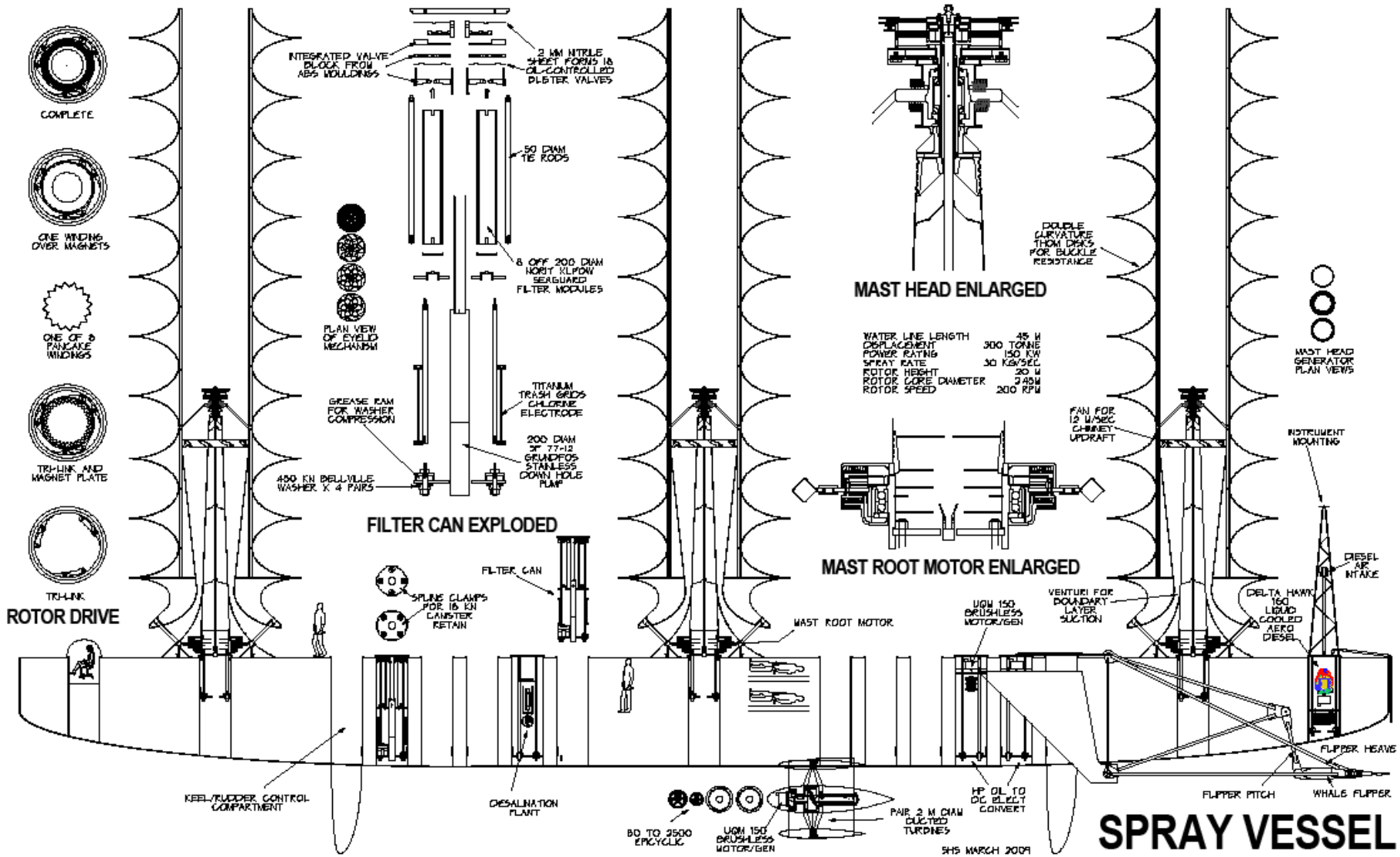
A Marples-Brown Searunner 34 converted to Flettner drive by John Marples under test in gentle winds
Fort Pierce FLA
2 February 2008

Enercon E-Ship I. Launched 1 August 2008

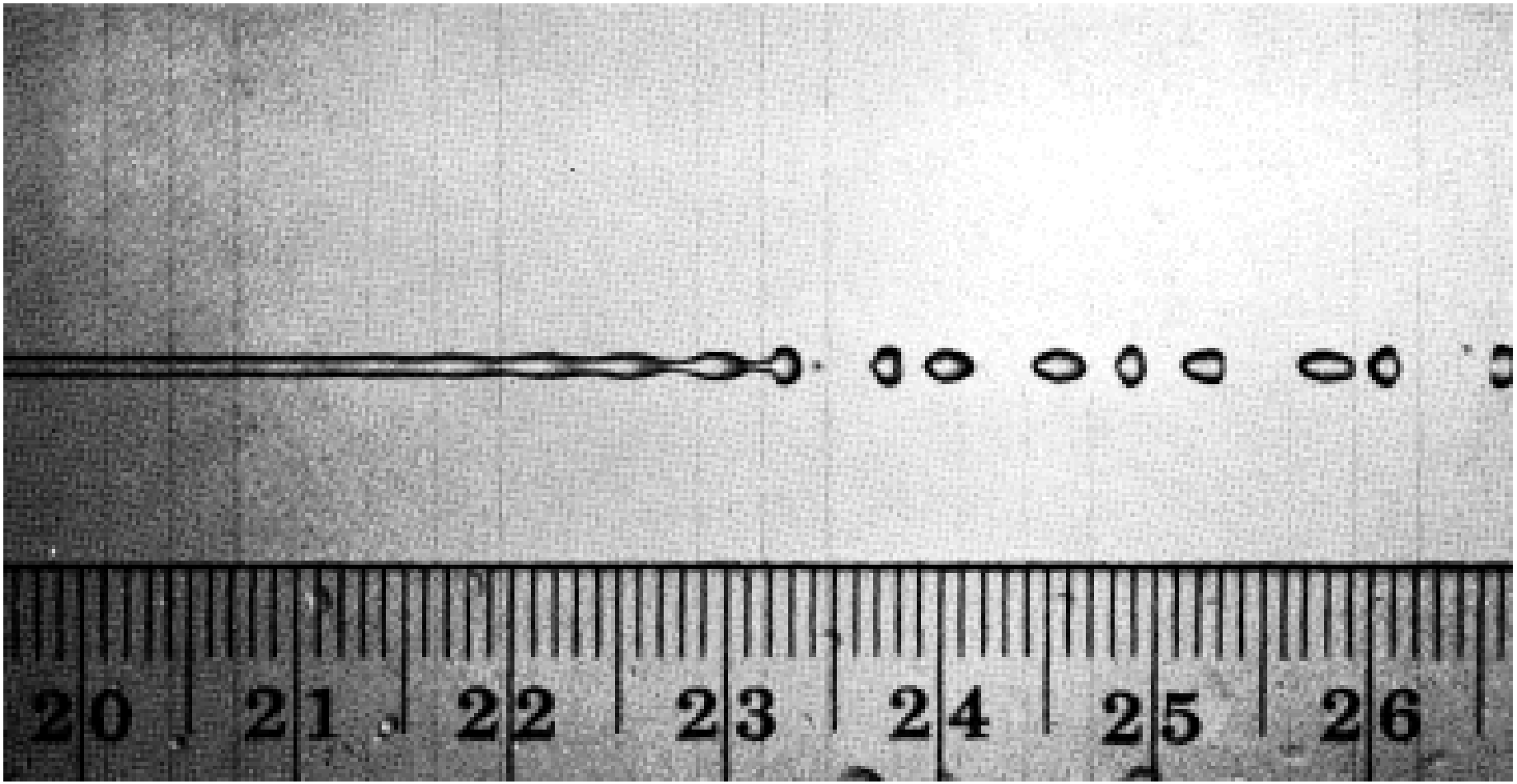


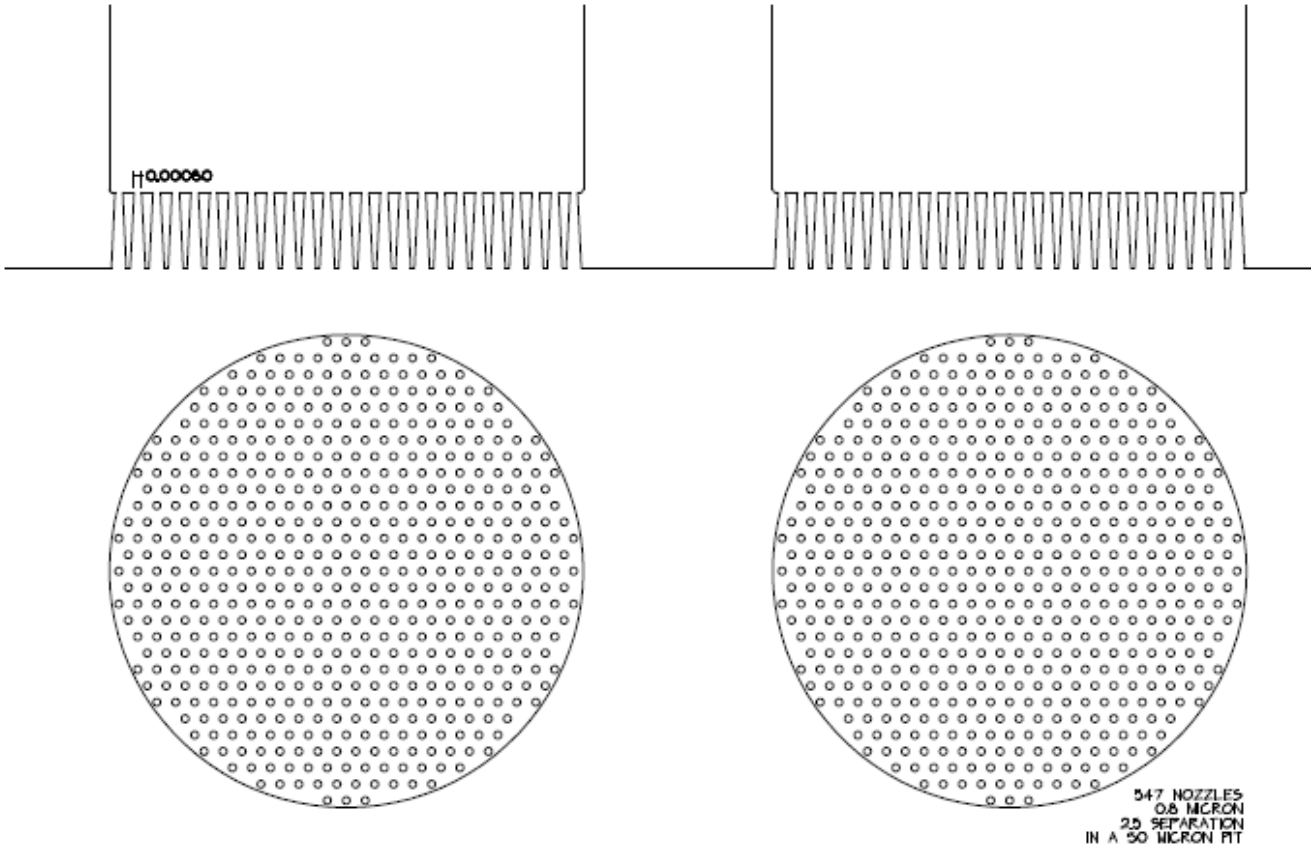
The Enercon E-Ship 1 being fitted out at Lindenau GmbH shipyard in Keil.

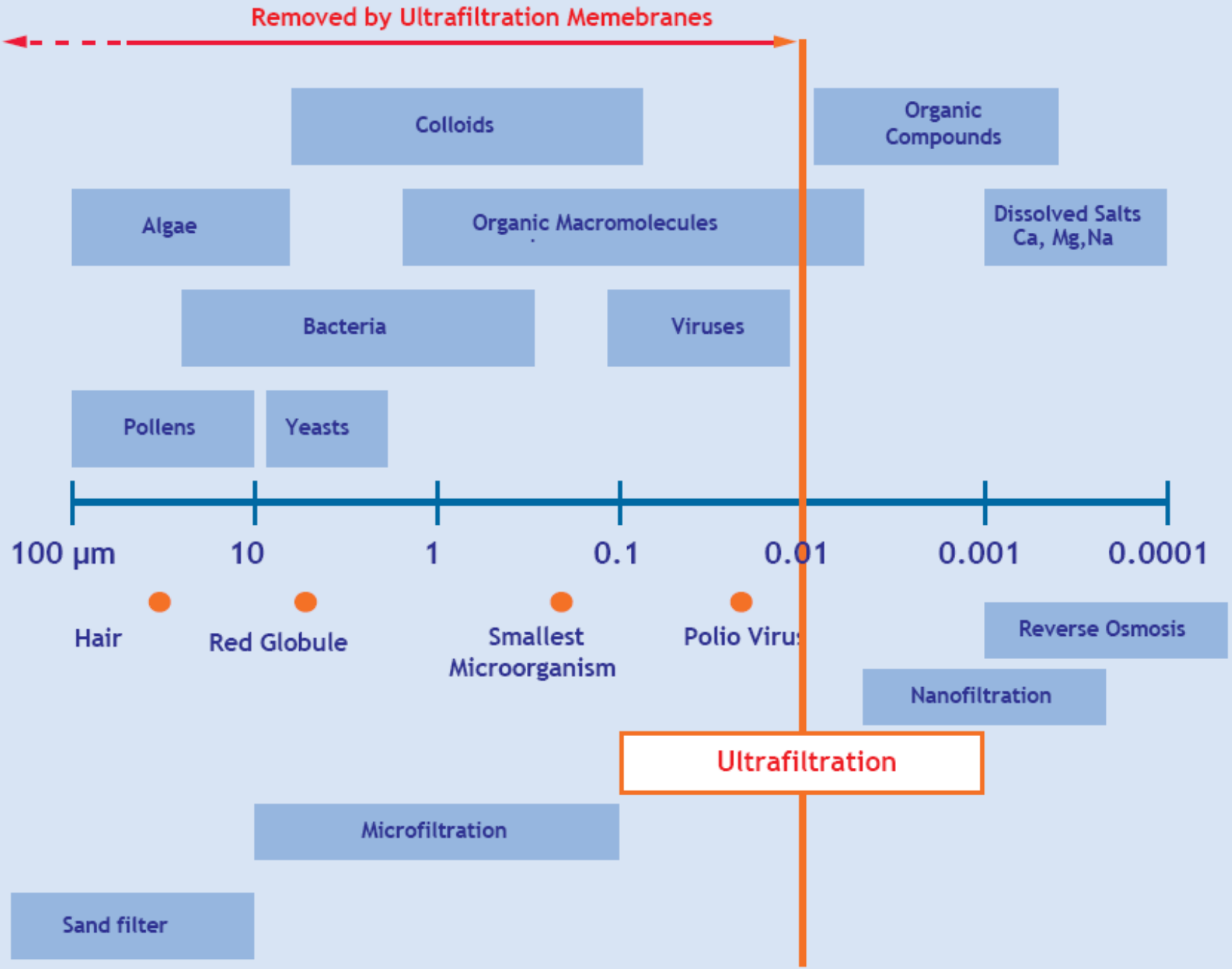

© John MacNeill

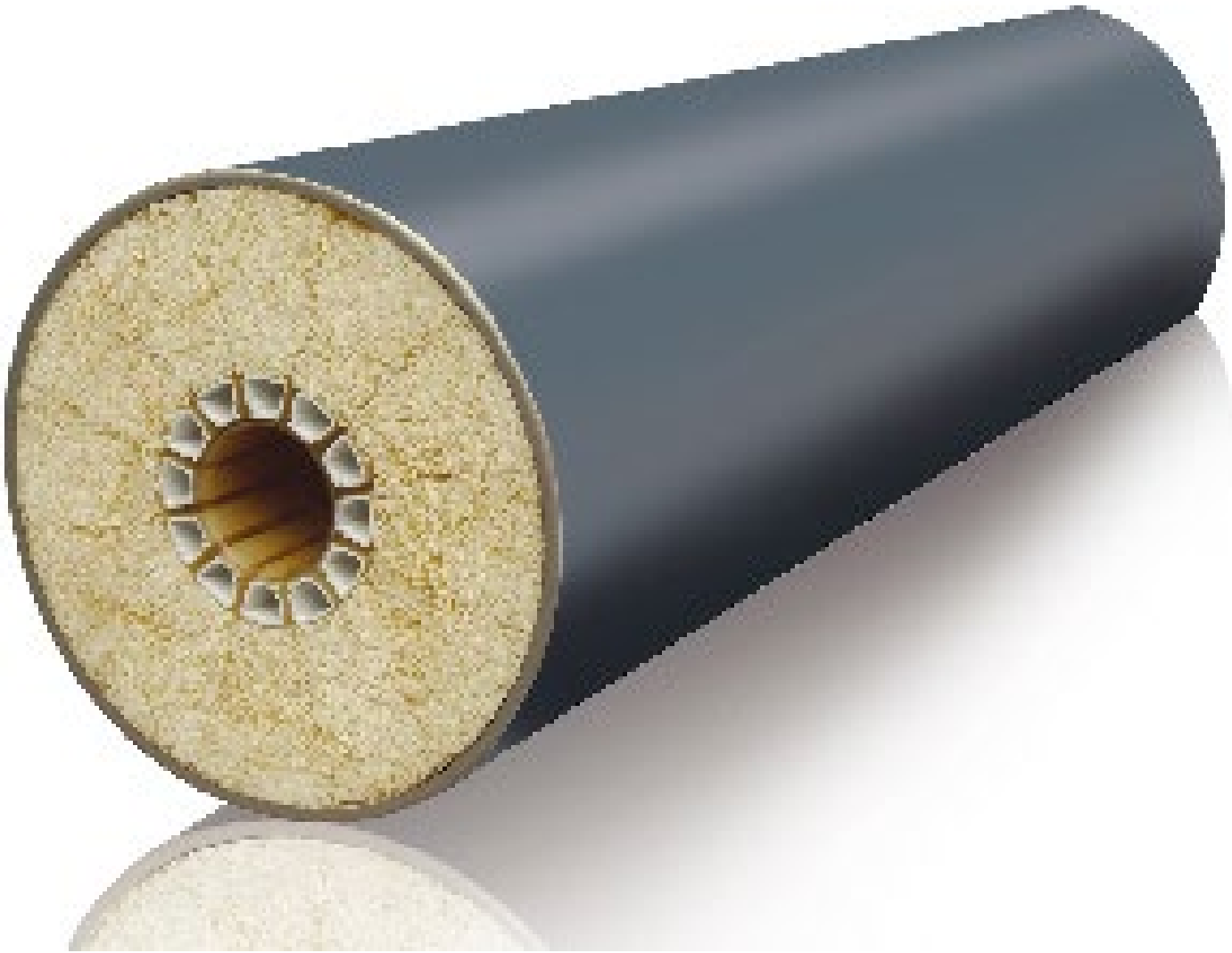

COMPLETE
ONE WINDING OVER MAGNETS
ONE OF 8 PANCAKE WINDINGS
TRI-LINK AND MAGNET PLATE
TRI-LINK
ROTOR DRIVE
INTEGRATED VALVE BLOCK FROM ABS MOULDINGS
2 MM NITRILE SHEET FORMS 16 OIL-CONTROLLED BLISTER VALVES
50 DIAM TIE RODS
8 OFF 200 DIAM NORIT KLP30W SERGUARD FILTER MODULES
PLAN VIEW OF EYELID MECHANISM
GREASE RAM FOR WASHER COMPRESSION
TITANIUM TRASH GRIDS CHLORINE ELECTRODE
200 DIAM SP 77-12 GRUNDFOS STAINLESS DOWN HOLE PUMP
450 KN BELLVILLE WASHER X 4 PAIRS
FILTER CAN EXPLODED
SPLINE CLAMPS FOR 16 KN CANISTER RETAIN
FILTER CAN
KEEL/RUDDER CONTROL COMPARTMENT
DESALINATION PLANT
BD TO 3500 EPICYCLIC
UQM 150 BRUSHLESS MOTOR/GEN
PAIR 2 M DIAM DUCTED TURBINES
HP OIL TO DC ELECT CONVERT
MAST ROOT MOTOR
UQM 150 BRUSHLESS MOTOR/GEN
VENTURI FOR BOUNDARY LAYER SUCTION
FLIPPER PITCH
WHALE FLIPPER
FLIPPER HEAVE
DIESEL AIR INTAKE
DEL-TA HAWK 160 LIQUID COOLED AERO DIESEL
INSTRUMENT MOUNTING
MAST HEAD GENERATOR PLAN VIEWS
FAN FOR 12 M/SEC CHIMNEY UPDRAFT
MAST ROOT MOTOR ENLARGED
DOUBLE CURVATURE THOM DISKS FOR BUCKLE RESISTANCE
MAST HEAD ENLARGED
WATER LINE LENGTH 45 M
DISPLACEMENT 300 TONNE
POWER RATING 150 KW
SPRAY RATE 30 KG/SEC
ROTOR HEIGHT 20 M
ROTOR CORE DIAMETER 2.45M
ROTOR SPEED 200 RPM
SHS MARCH 2009
SPRAY VESSEL

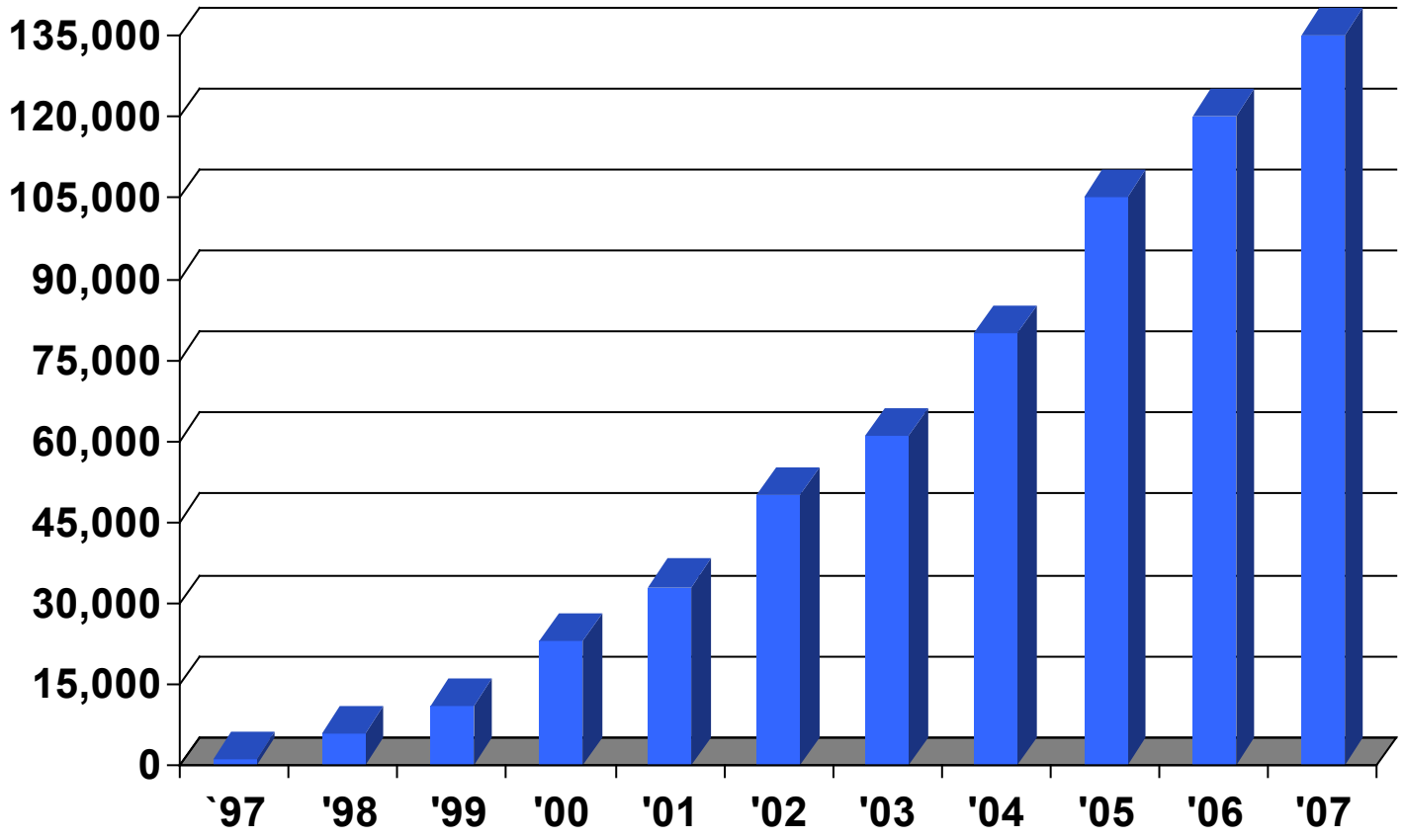
Rayleigh. 1878 On the instability of jets. Proc. Lond. Math. Soc. S1–10, 4 –13.



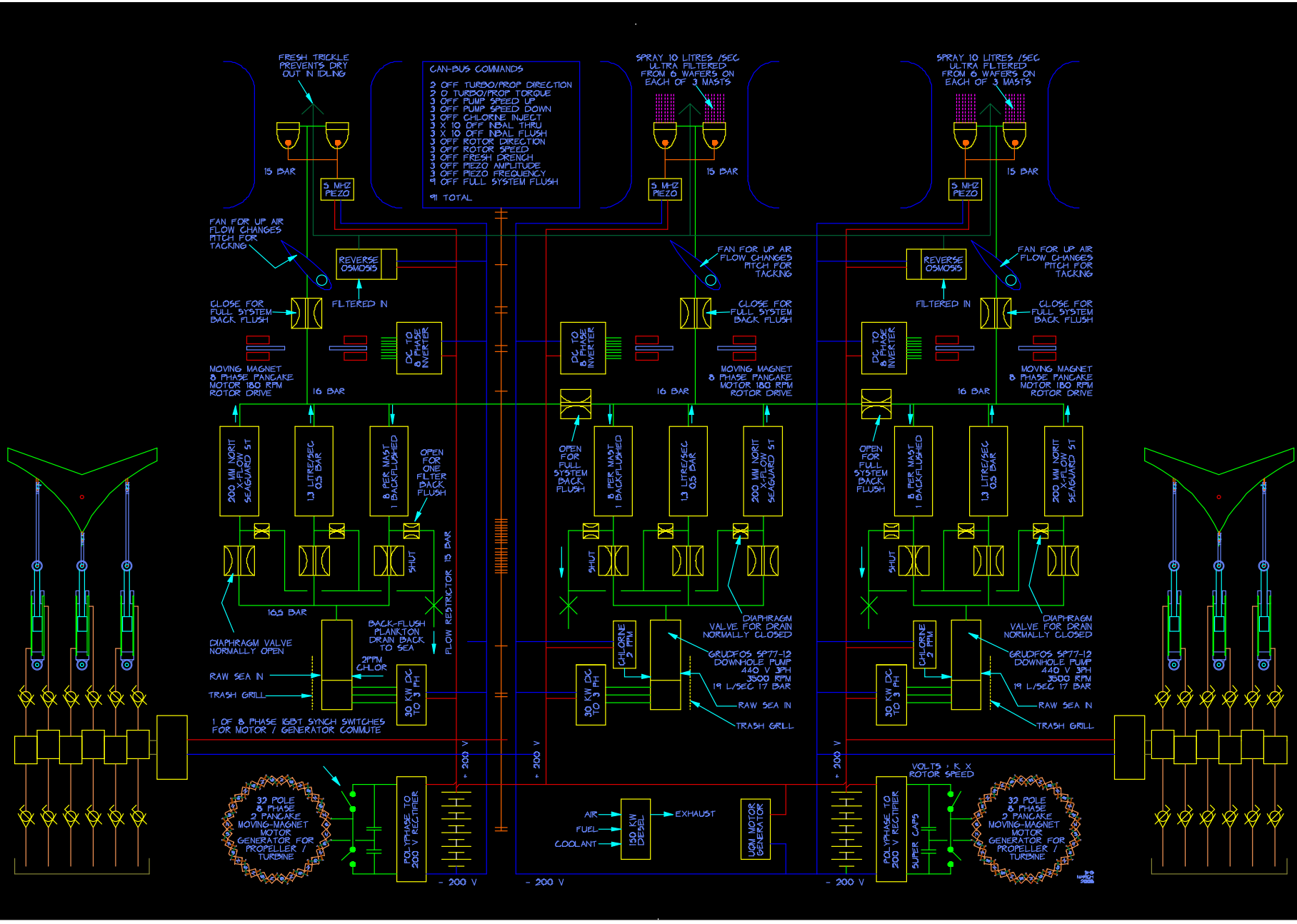

H0.00060
547 NOZZLES
0.8 MICRON
2.5 SEPARATION
IN A 50 MICRON PIT

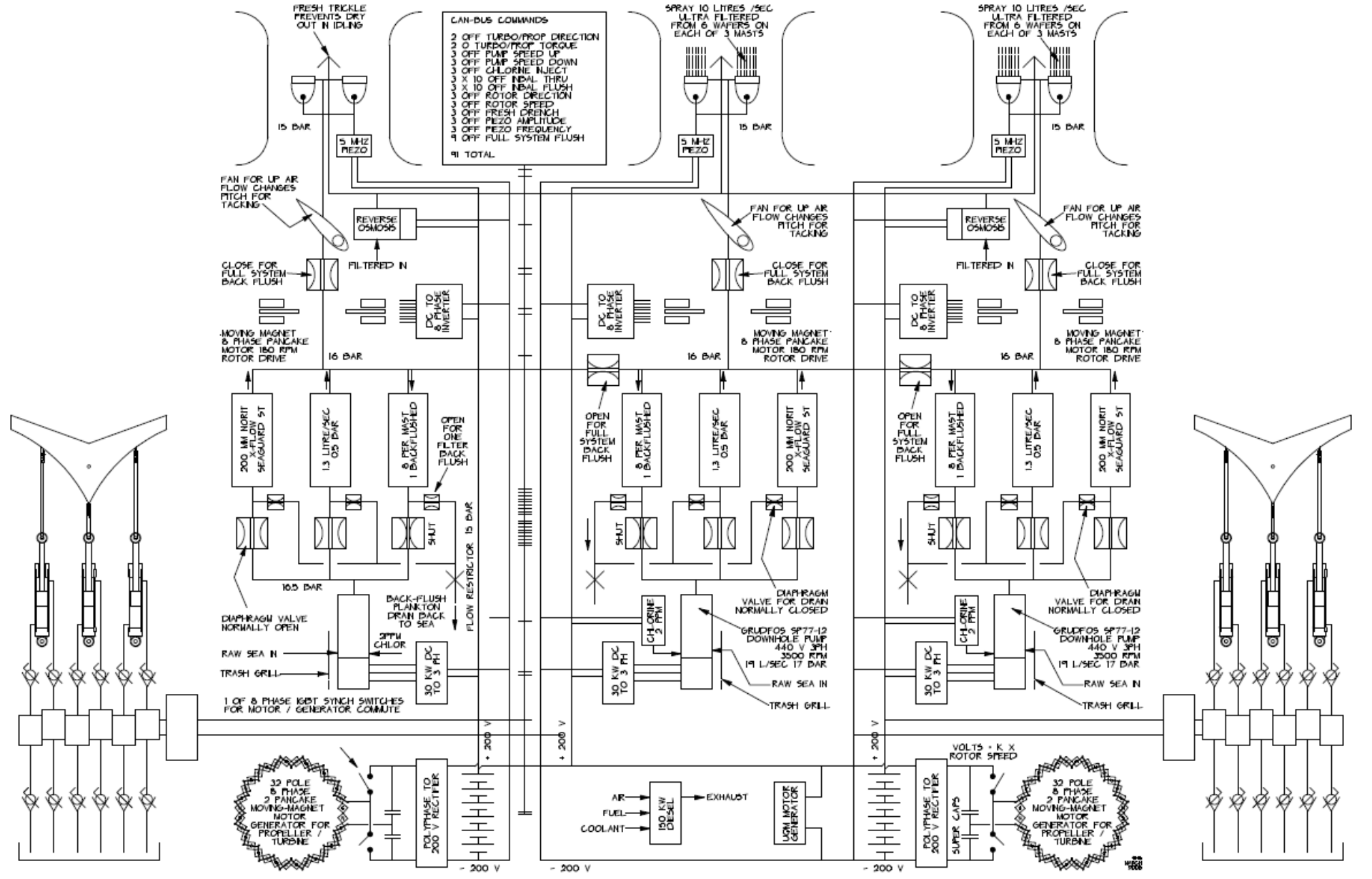

Removed by Ultrafiltration Memebranes
Colloids
Organic Compounds
Algae
Organic Macromolecules
Dissolved Salts Ca, Mg,Na
Bacteria
Viruses
Pollens
Yeasts
100 µm
10
1
0.1
0.01
0.001
0.0001
Hair
Red Globule
Smallest Microorganism
Polio Virus
Reverse Osmosis
Nanofiltration
Ultrafiltration
Microfiltration
Sand filter

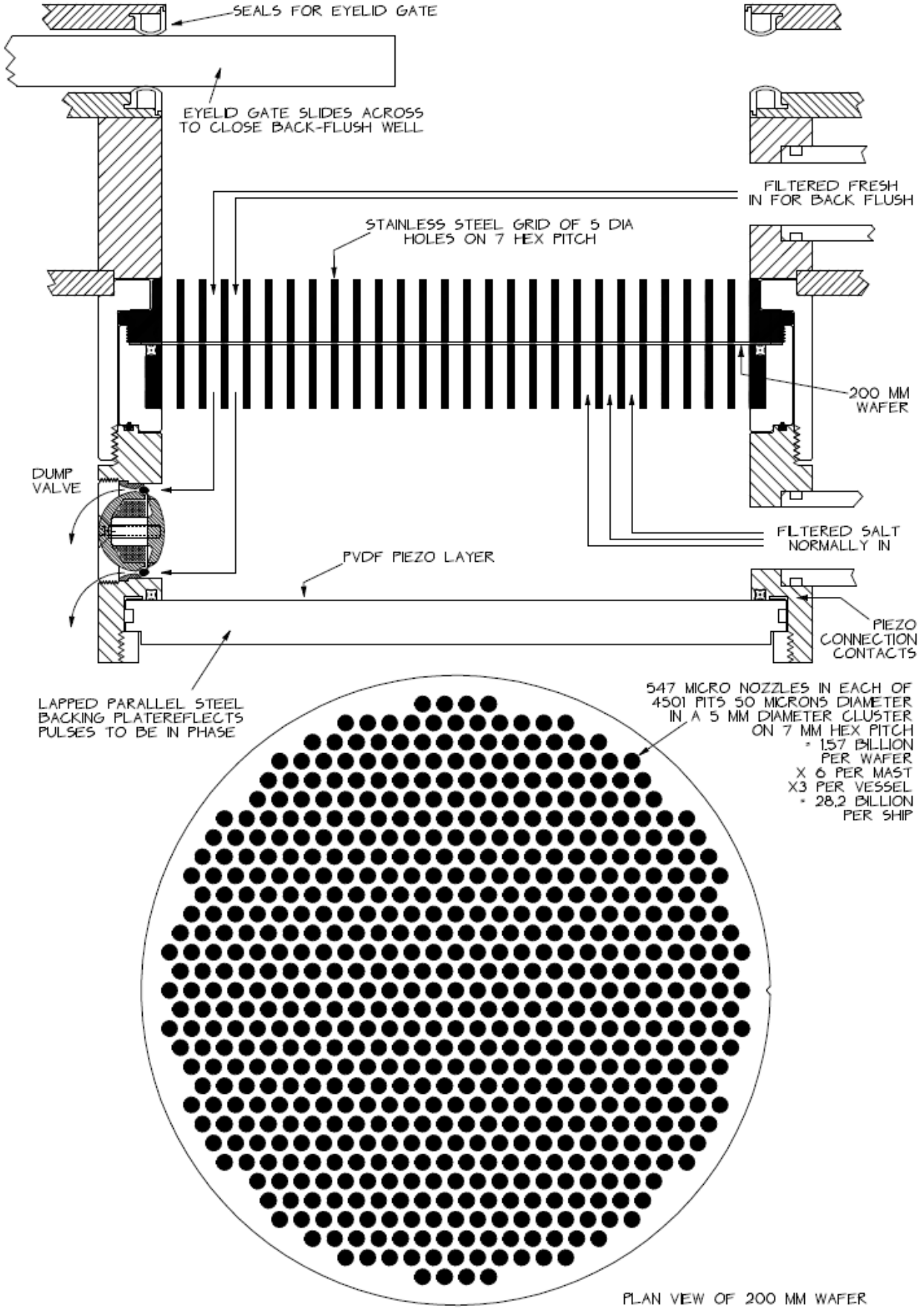


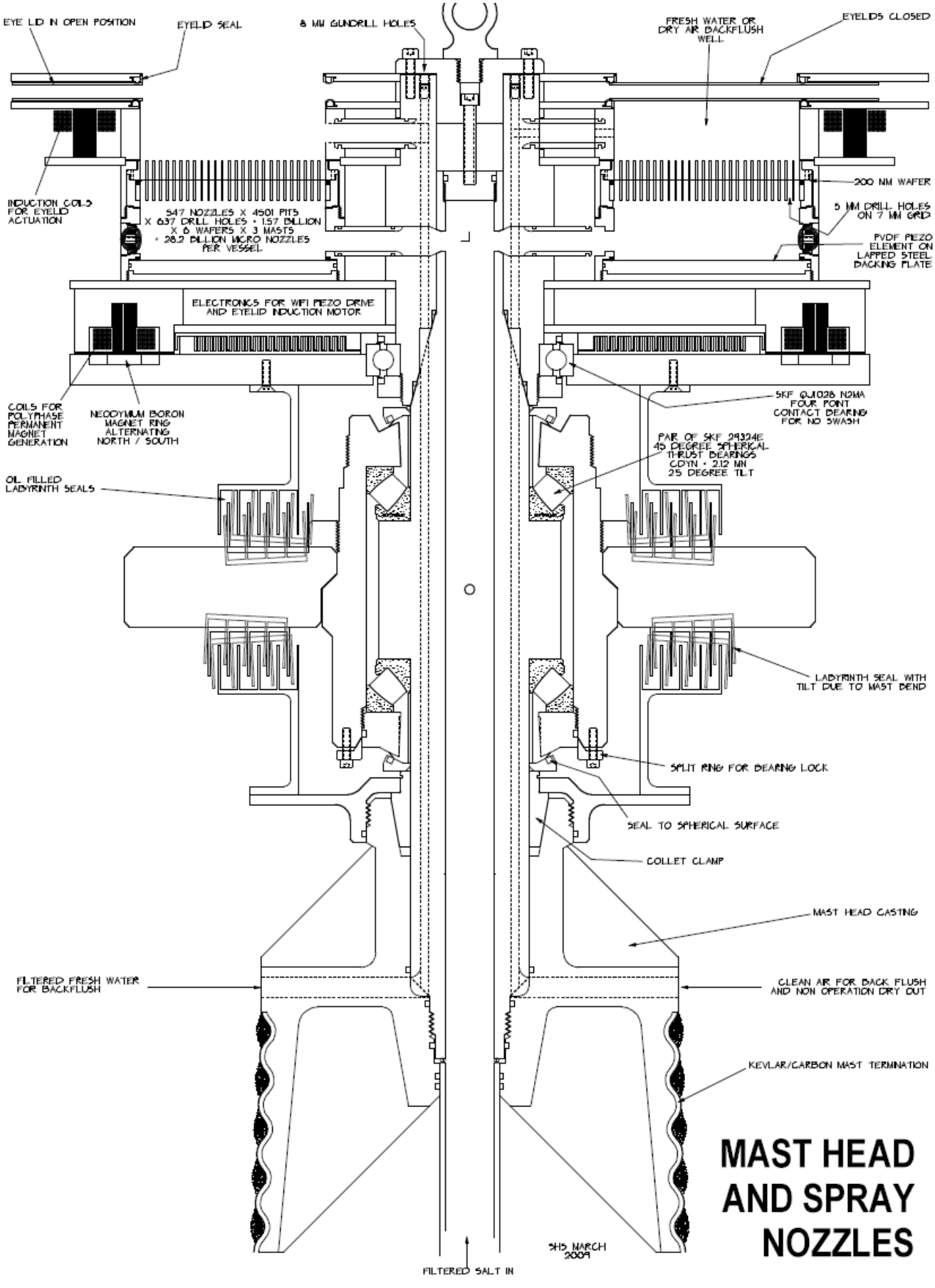


The cumulative installation of Norit Seaguard filters for reverse osmosis applications. By 2009 the installed capacity was 170,000 cubic metres and hour or 47 cubic metres a second.

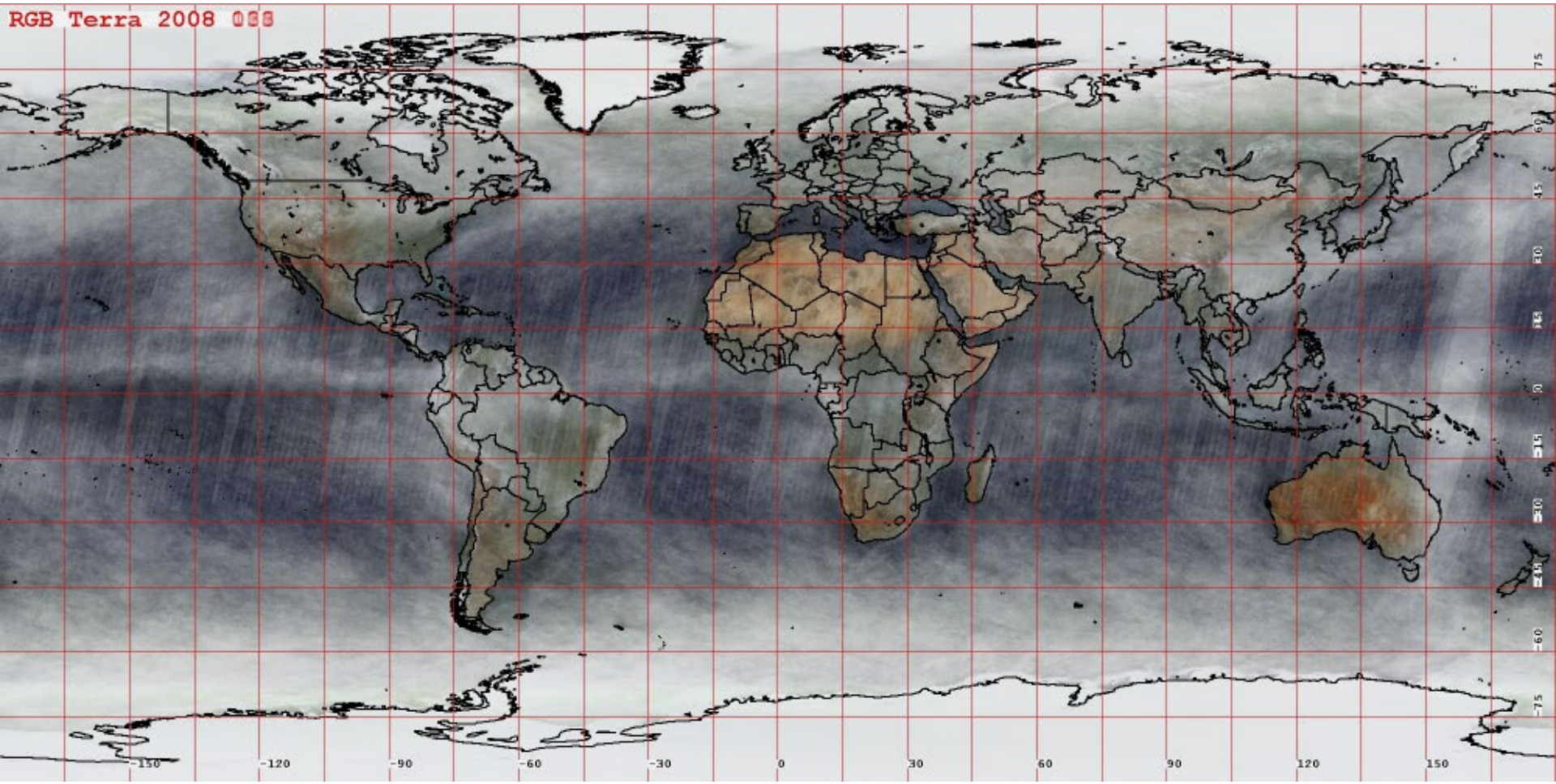

FRESH TRICKLE PREVENTS DRY OUT IN IDLING
CAN-BUS COMMANDS
3 OFF TURBO/PROP DIRECTION
3 O TURBO/PROP TORQUE
3 OFF PUMP SPEED UP
3 OFF PUMP SPEED DOWN
3 OFF CHLORINE INJECT
3 X 10 OFF INBAL THRU
3 X 10 OFF INBAL FLUSH
3 OFF ROTOR DIRECTION
3 OFF ROTOR SPEED
3 OFF FRESH DRENCH
3 OFF PIEZO AMPLITUDE
3 OFF PIEZO FREQUENCY
1 OFF FULL SYSTEM FLUSH
91 TOTAL
SPRAY 10 LITRES /SEC ULTRA FILTERED FROM 8 WAFERS ON EACH OF 3 MASTS
SPRAY 10 LITRES /SEC ULTRA FILTERED FROM 8 WAFERS ON EACH OF 3 MASTS
15 BAR
15 BAR
15 BAR
5 MHZ PIEZO
5 MHZ PIEZO
5 MHZ PIEZO
FAN FOR UP AIR FLOW CHANGES PITCH FOR TACKING
FAN FOR UP AIR FLOW CHANGES PITCH FOR TACKING
FAN FOR UP AIR FLOW CHANGES PITCH FOR TACKING
REVERSE OSMOSIS
REVERSE OSMOSIS
FILTERED IN
FILTERED IN
CLOSE FOR FULL SYSTEM BACK FLUSH
CLOSE FOR FULL SYSTEM BACK FLUSH
CLOSE FOR FULL SYSTEM BACK FLUSH
DC TO 8 PHASE INVERTER
DC TO 8 PHASE INVERTER
DC TO 8 PHASE INVERTER
MOVING MAGNET 8 PHASE PANCAKE MOTOR 180 RPM ROTOR DRIVE
MOVING MAGNET 8 PHASE PANCAKE MOTOR 180 RPM ROTOR DRIVE
MOVING MAGNET 8 PHASE PANCAKE MOTOR 180 RPM ROTOR DRIVE
16 BAR
16 BAR
16 BAR
200 MM NORIT X-FLOW SEAGUARD 5T
1.3 LITRE/SEC 0.5 BAR
8 PER MAST 1 BACKFLUSHED
OPEN FOR ONE FILTER BACK FLUSH
OPEN FOR FULL SYSTEM BACK FLUSH
8 PER MAST 1 BACKFLUSHED
1.3 LITRE/SEC 0.5 BAR
200 MM NORIT X-FLOW SEAGUARD 5T
OPEN FOR FULL SYSTEM BACK FLUSH
8 PER MAST 1 BACKFLUSHED
1.3 LITRE/SEC 0.5 BAR
200 MM NORIT X-FLOW SEAGUARD 5T
SHUT
SHUT
SHUT
FLOW RESTRICTOR 15 BAR
16.5 BAR
DIAPHRAGM VALVE NORMALLY OPEN
BACK-FLUSH PLANKTON DRAIN BACK TO SEA
2PPM CHLOR
RAW SEA IN
TRASH GRILL
30 KW DC TO 3 PH
1 OF 8 PHASE IGBT SYNCH SWITCHES FOR MOTOR / GENERATOR COMMUTE
CHLORINE 2 PPM
30 KW DC TO 3 PH
DIAPHRAGM VALVE FOR DRAIN NORMALLY CLOSED
GRUDFOS SP77-12 DOWNHOLE PUMP 440 V 3PH 3500 RPM 19 L/SEC 17 BAR
RAW SEA IN
TRASH GRILL
CHLORINE 2 PPM
30 KW DC TO 3 PH
DIAPHRAGM VALVE FOR DRAIN NORMALLY CLOSED
GRUDFOS SP77-12 DOWNHOLE PUMP 440 V 3PH 3500 RPM 19 L/SEC 17 BAR
RAW SEA IN
TRASH GRILL
+ 200 V
+ 200 V
+ 200 V
VOLTS , R X ROTOR SPEED
32 POLE 8 PHASE 2 PANCAKE MOVING-MAGNET MOTOR GENERATOR FOR PROPELLER / TURBINE
POLYPHASE TO 200 V RECTIFIER
AIR
FUEL
COOLANT
150 KW DIESEL
EXHAUST
UQM MOTOR GENERATOR
POLYPHASE TO 200 V RECTIFIER
SUPER CAPS
32 POLE 8 PHASE 2 PANCAKE MOVING-MAGNET MOTOR GENERATOR FOR PROPELLER / TURBINE
- 200 V
- 200 V
- 200 V


FRESH TRICKLE PREVENTS DRY OUT IN IDLING
CAN-BUS COMMANDS
2 OFF TURBO/PROP DIRECTION
3 O TURBO/PROP TORQUE
3 OFF PUMP SPEED UP
3 OFF PUMP SPEED DOWN
3 OFF CHLORINE INJECT
3 X 10 OFF INBAL THRU
3 X 10 OFF INBAL FLUSH
3 OFF ROTOR DIRECTION
3 OFF ROTOR SPEED
3 OFF FRESH DRENCH
3 OFF PIEZO AMPLITUDE
3 OFF PIEZO FREQUENCY
9 OFF FULL SYSTEM FLUSH
91 TOTAL
SPRAY 10 LITRES /SEC ULTRA FILTERED FROM 6 WAFERS ON EACH OF 3 MASTS
15 BAR
5 MHZ PIEZO
FAN FOR UP AIR FLOW CHANGES PITCH FOR TACKING
REVERSE OSMOSIS
FILTERED IN
CLOSE FOR FULL SYSTEM BACK FLUSH
DC TO 3 PHASE INVERTER
MOVING MAGNET 8 PHASE PANCAKE MOTOR 180 RPM ROTOR DRIVE
16 BAR
200 MM NORIT X-FLOW ST SEAGUARD ST
1.3 LITRE/SEC 0.5 BAR
8 PER MAST 1 BACKFLUSHED
OPEN FOR ONE FILTER BACK FLUSH
OPEN FOR FULL SYSTEM BACK FLUSH
SHUT
FLOW RESTRICTOR 15 BAR
16.5 BAR
DIAPHRAGM VALVE NORMALLY OPEN
DIAPHRAGM VALVE FOR DRAIN NORMALLY CLOSED
BACK-FLUSH PLANKTON DRAIN BACK TO SEA
3PPM CHLOR
CHLORINE 2 PPM
GRUDFOS SP77-12 DOWNHOLE PUMP 440 V 3PH 3500 RPM 19 L/SEC 17 BAR
RAW SEA IN
TRASH GRILL
30 KW DC TO 3 PH
1 OF 8 PHASE IGBT SYNCH SWITCHES FOR MOTOR / GENERATOR COMMUTE
+ 200 V
- 200 V
32 POLE 8 PHASE 2 PANCAKE MOVING-MAGNET MOTOR GENERATOR FOR PROPELLER / TURBINE
POLYPHASE TO 200 V RECTIFIER
AIR
FUEL
COOLANT
150 KW DIESEL
EXHAUST
UGM MOTOR GENERATOR
VOLTS = K X ROTOR SPEED
SUPER CAPS


SEALS FOR EYELID GATE
EYELID GATE SLIDES ACROSS TO CLOSE BACK-FLUSH WELL
FILTERED FRESH IN FOR BACK FLUSH
STAINLESS STEEL GRID OF 5 DIA HOLES ON 7 HEX PITCH
200 MM WAFER
DUMP VALVE
FILTERED SALT NORMALLY IN
PVDF PIEZO LAYER
PIEZO CONNECTION CONTACTS
LAPPED PARALLEL STEEL BACKING PLATEREFLECTS PULSES TO BE IN PHASE
547 MICRO NOZZLES IN EACH OF 4501 PITS 50 MICRONS DIAMETER IN A 5 MM DIAMETER CLUSTER ON 7 MM HEX PITCH
= 1.57 BILLION PER WAFER
X 6 PER MAST
X3 PER VESSEL
= 28.2 BILLION PER SHIP
PLAN VIEW OF 200 MM WAFER



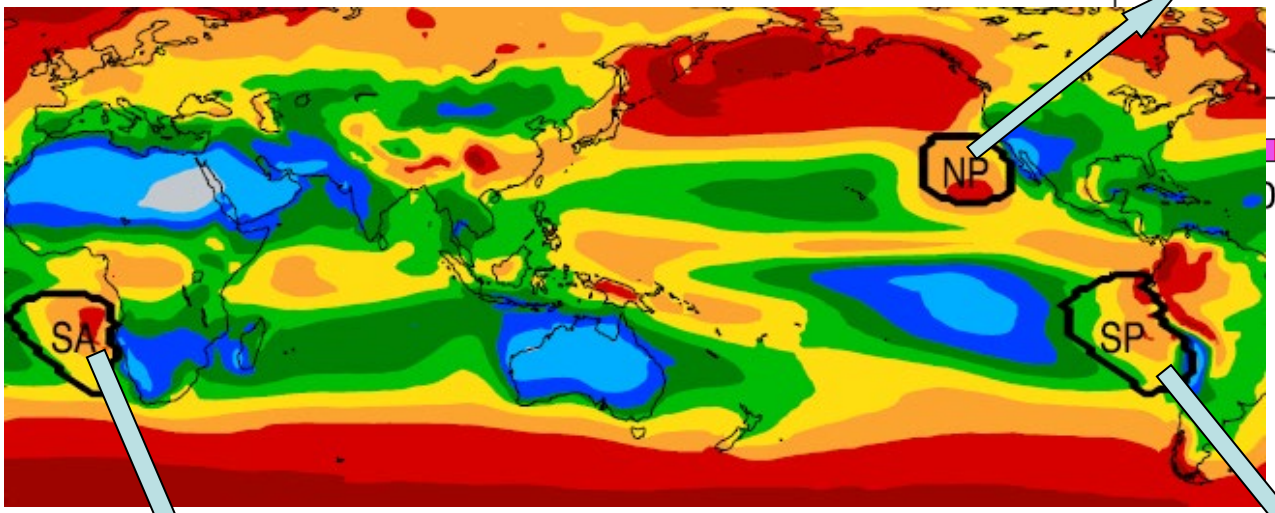
MAST HEAD AND SPRAY NOZZLES



28 Days each of RGB data from January and June 2008
http://ladsweb.nascom.nasa.gov/browse_images/l2_browser.html

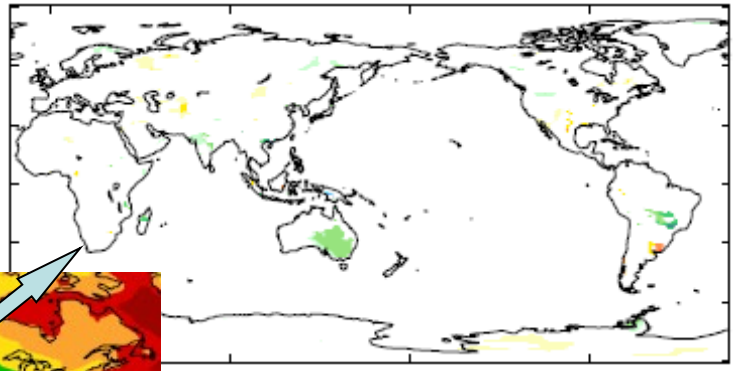
Gentle Massage or

Punch in the solar plexus ?

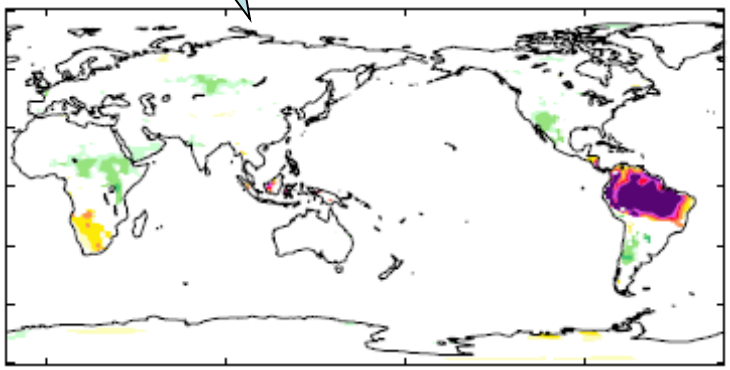


Cloud fraction

0 0.2 0.4 0.6 0.8

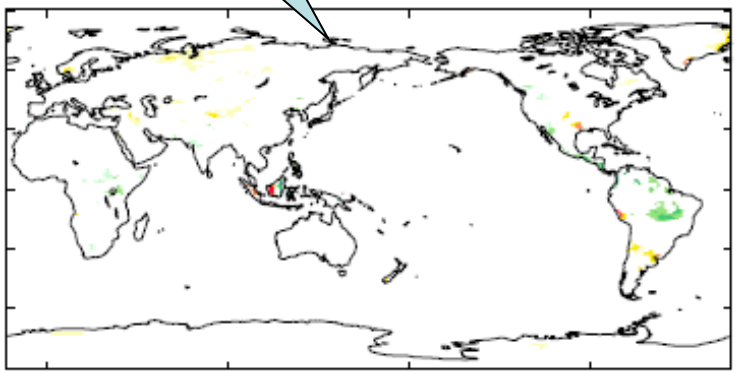


.8 -0.4 0 0.4 0.8



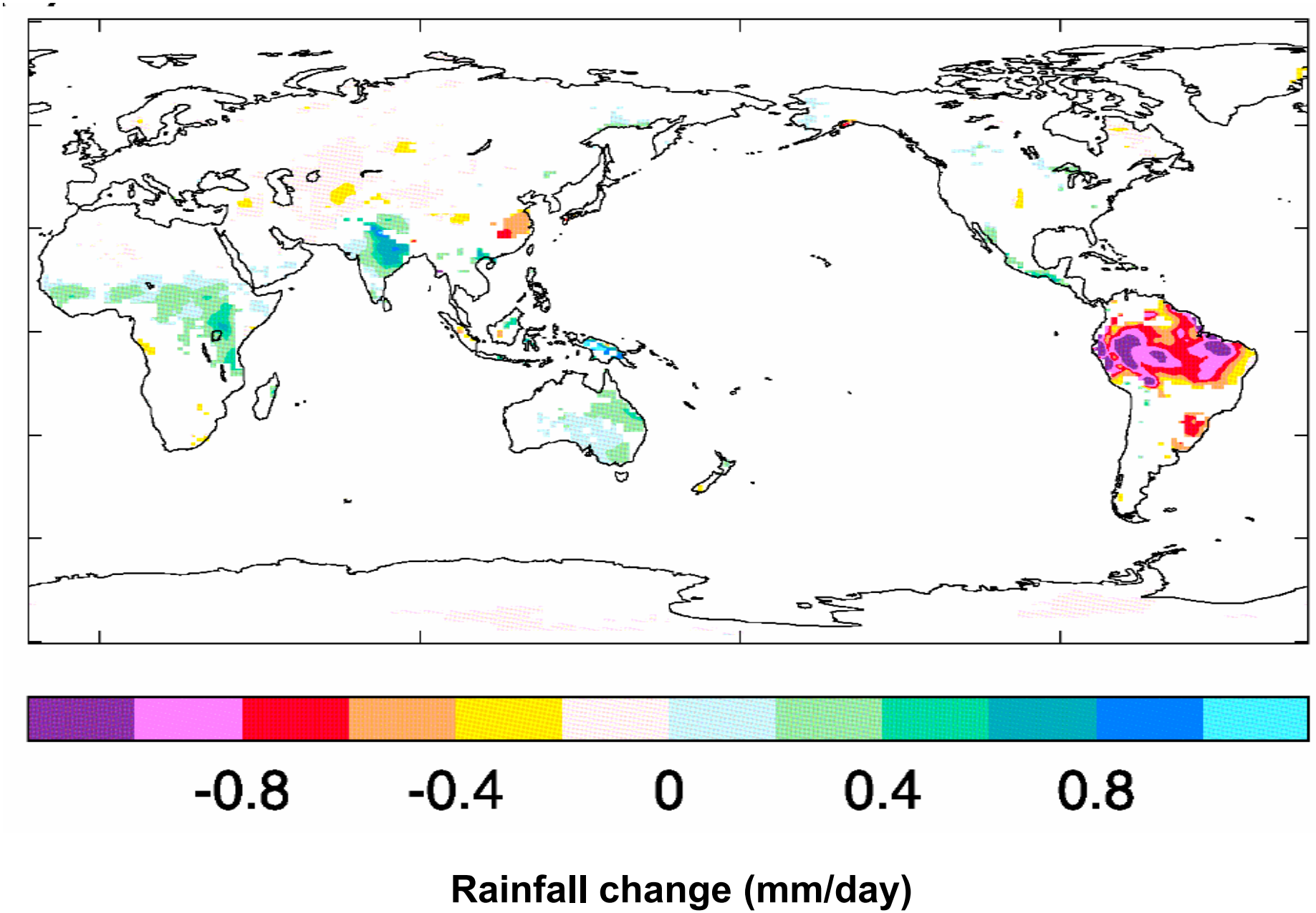
-0.8 -0.4 0 0.4 0.8

precipitation
mm / day



-0.8 -0.4 0 0.4 0.8

Impact of cloud geo-engineering on rainfall for 2030–2059



While there is clearly significant benefit in delaying increased temperatures, the results also reveal the downside to such geoengineering. The most serious is a sharp decrease in rainfall over South America, which would likely accelerate the die-back of the Amazon rainforest and the subsequent loss of one of the world's major carbon stores.

Hadley Centre 4 June 2009

There were also side effects of influencing the clouds, however. Seeding off the coast of South Africa leads to a knock-on effect which reduces Amazon rainforest rainfall by 30%. This could accelerate die-back of the forest, which is one of the world's major carbon stores, thus releasing huge amounts of carbon into the atmosphere.

Hadley Centre 8 September 2009

0.8 mm / day x 365 days = 292 mm / year

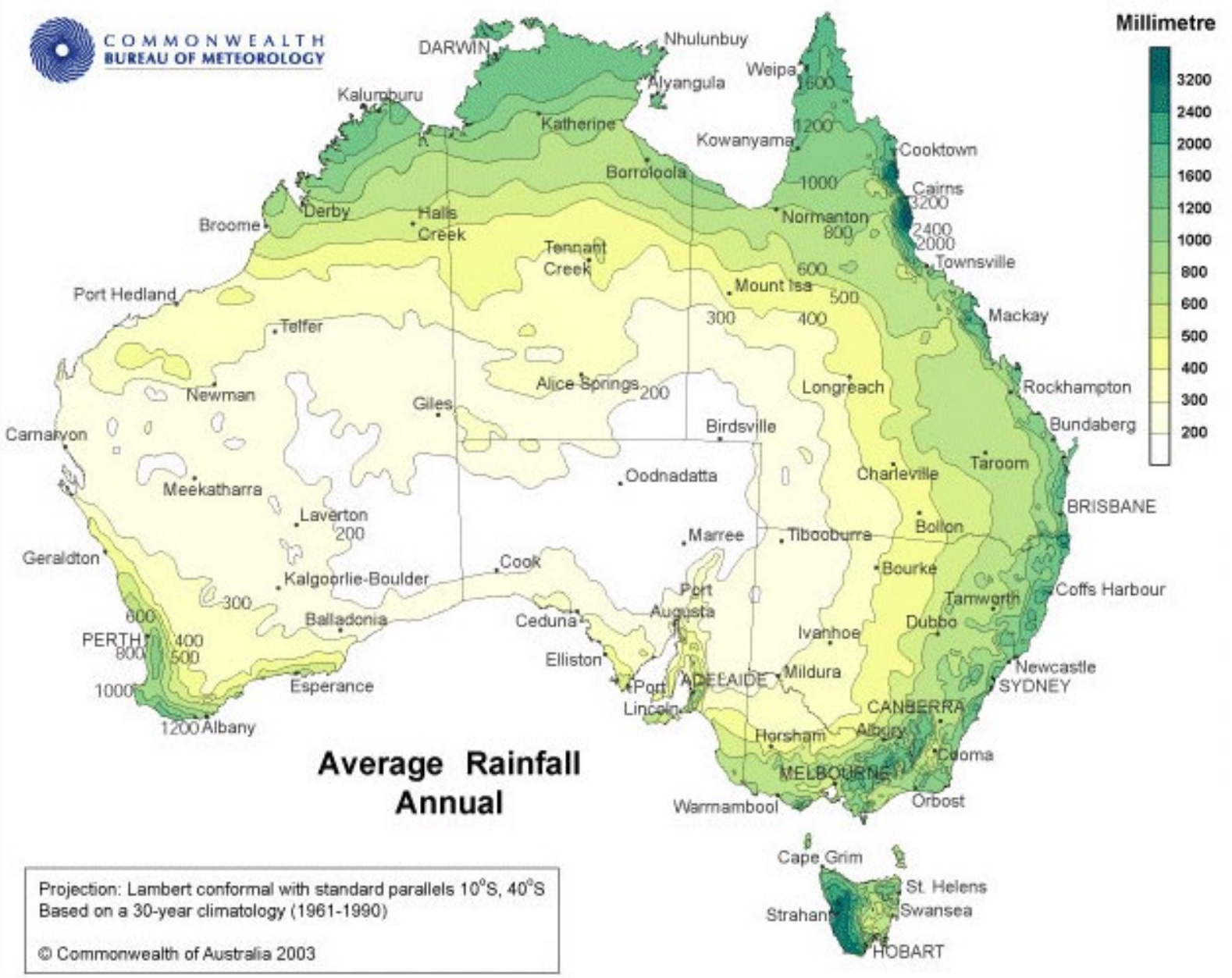
Present Amazon basin rainfall 2000 mm/year

Reduction = 14.6 %

2000 mm – 292 mm = 1708 mm /year

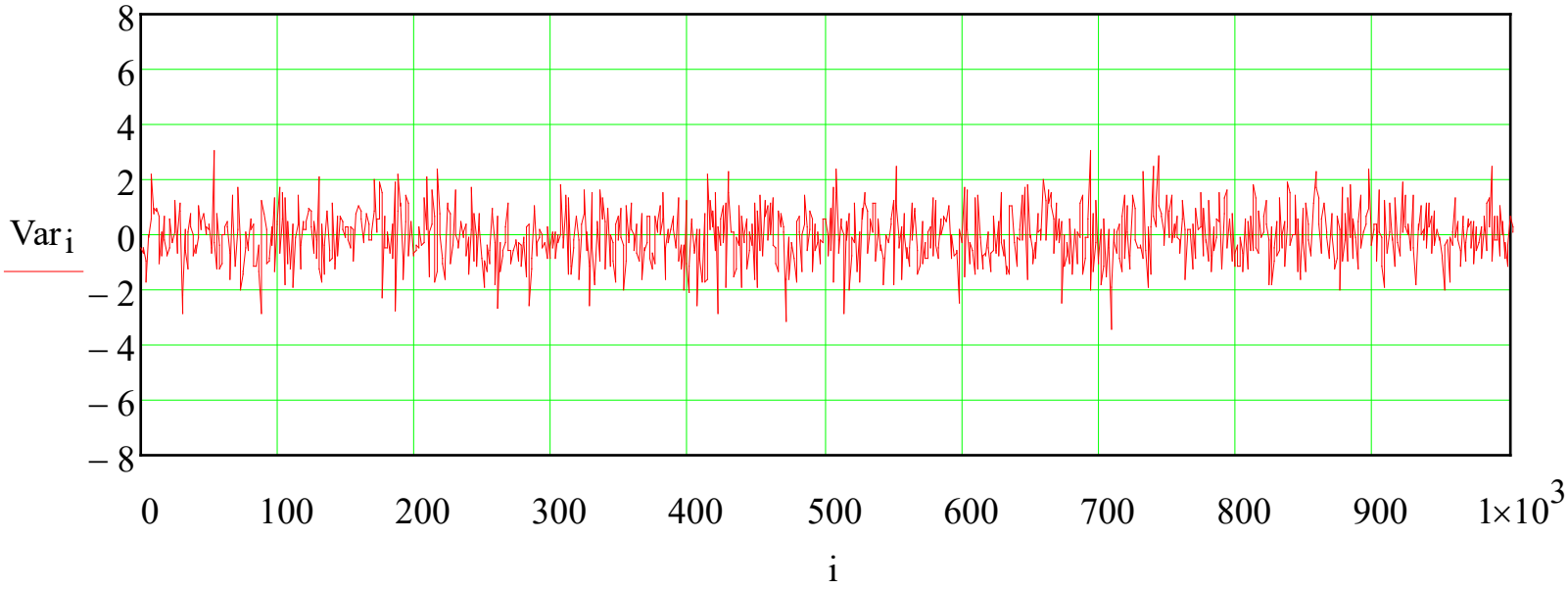
Precipitation – evaporation = ?

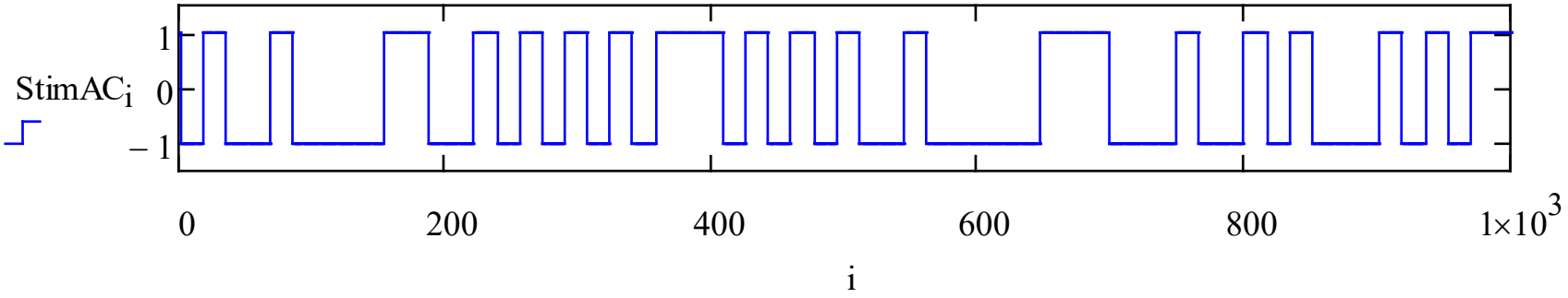
Time of year that spraying is done ?



365 x 0.25 mm = + 90 mm / year

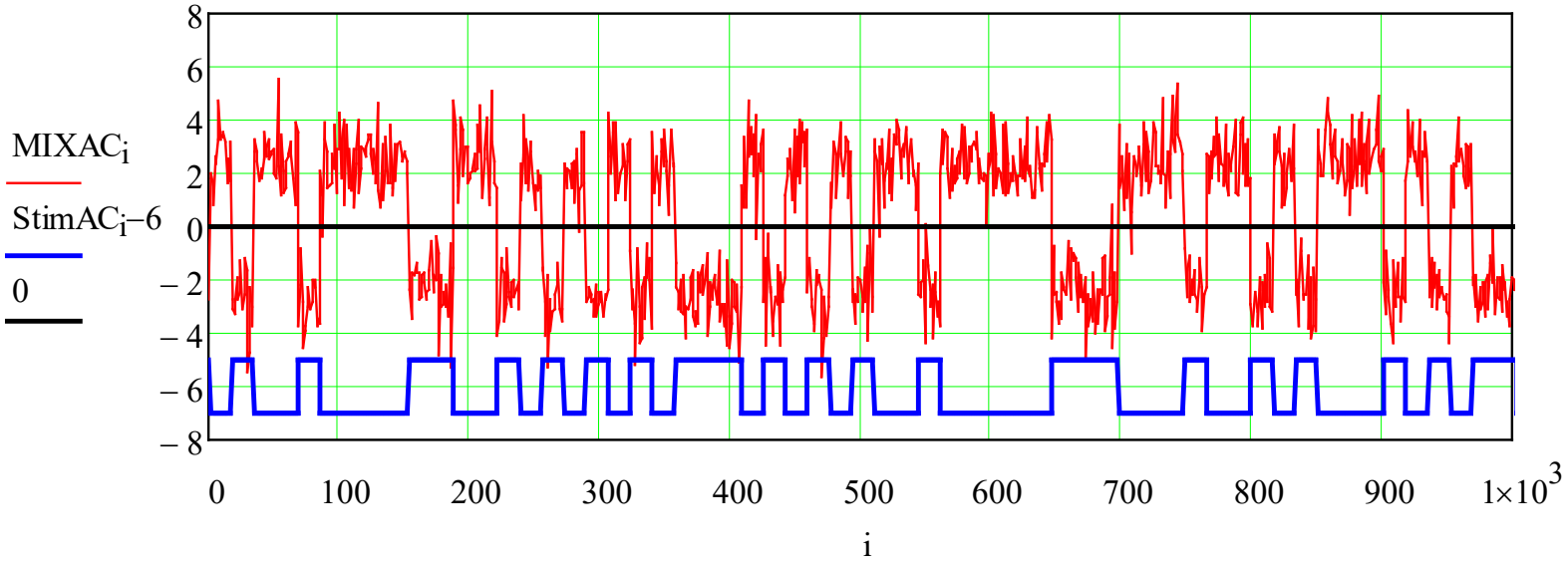
Random signal with Gaussian probabilty and standard deviation 1.



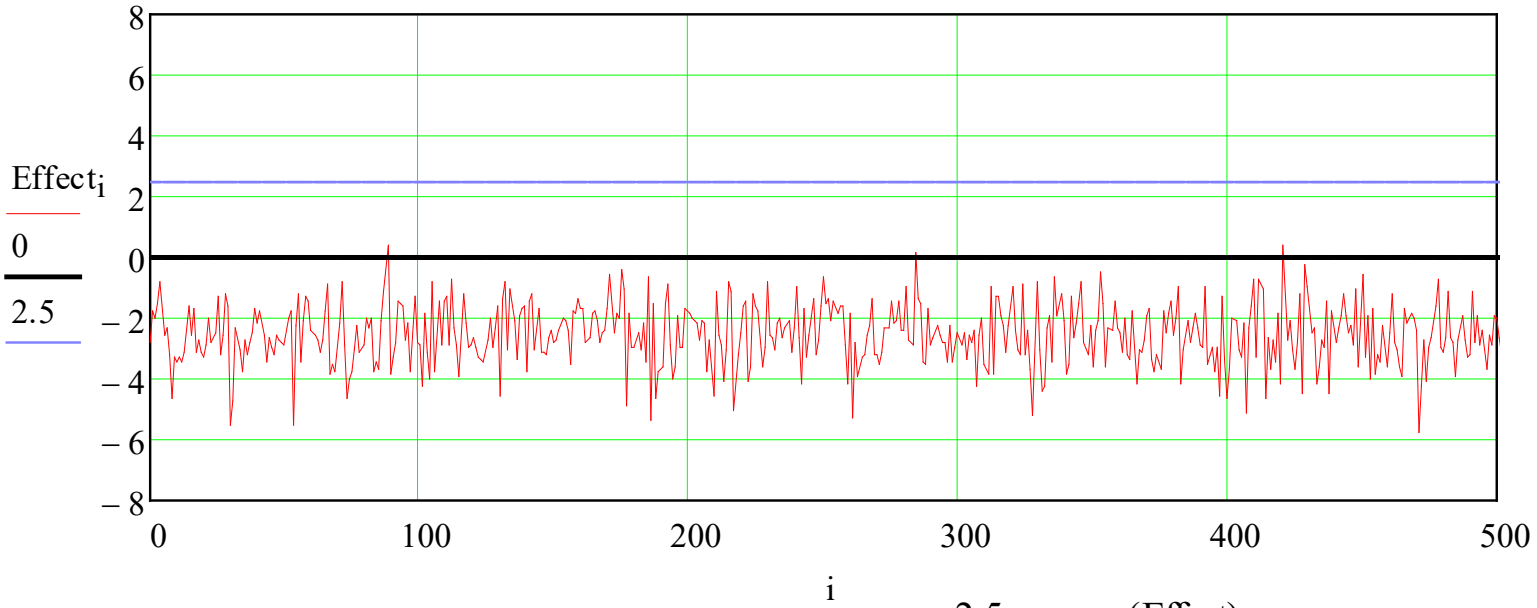


Pseudo-random but known sequence of +1 and -1

If blue is high subtract 2.5 from the red. If blue is low add 2.5 to red.

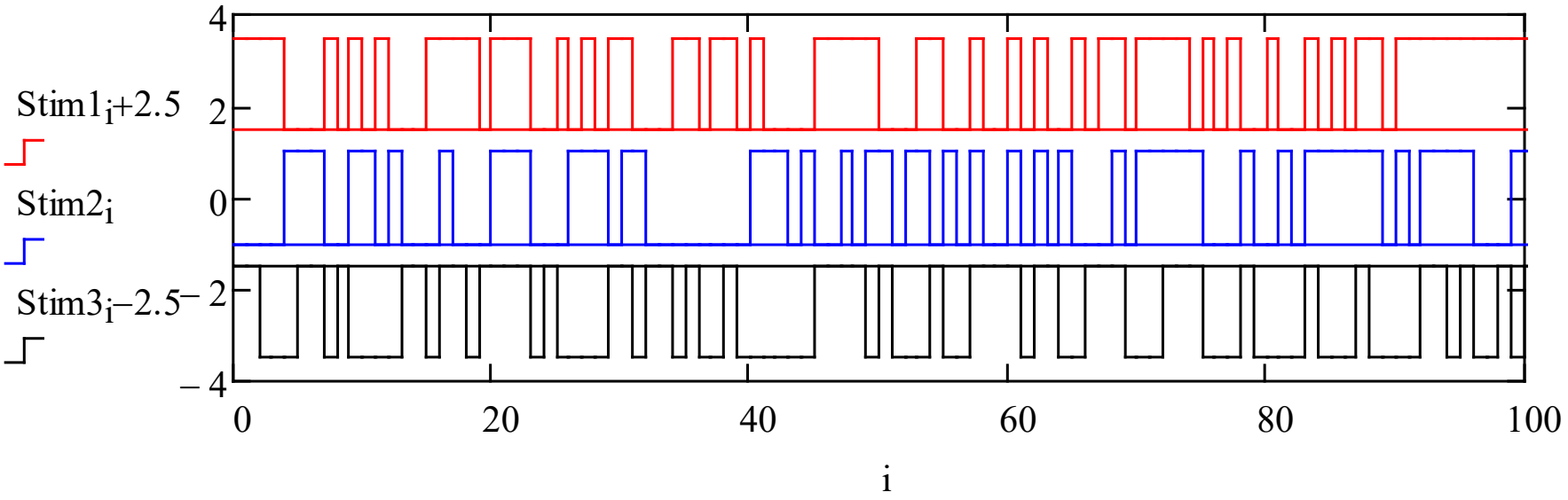


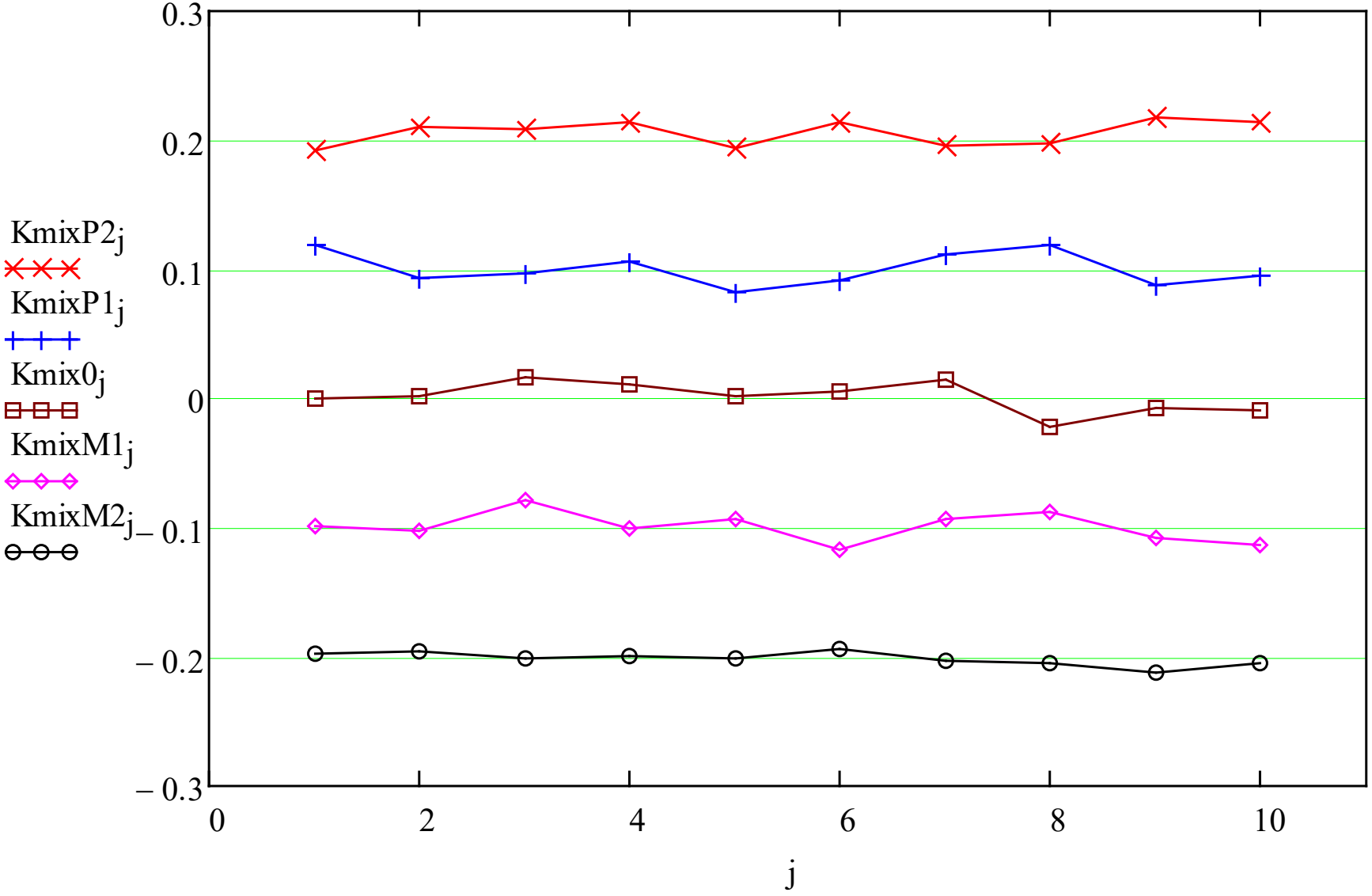
If blue is low divide by -1 ie invert. If blue is high divide by +1.

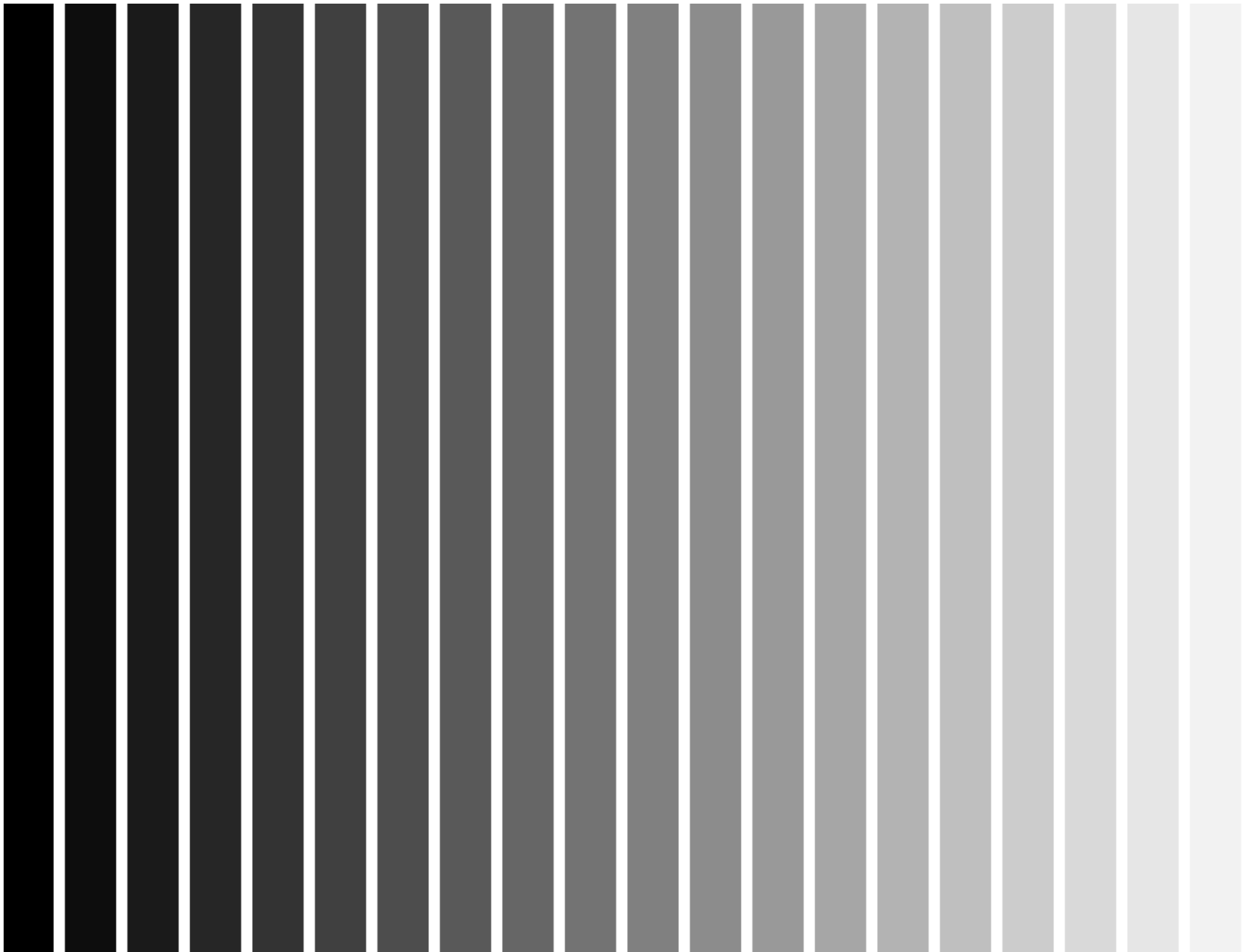


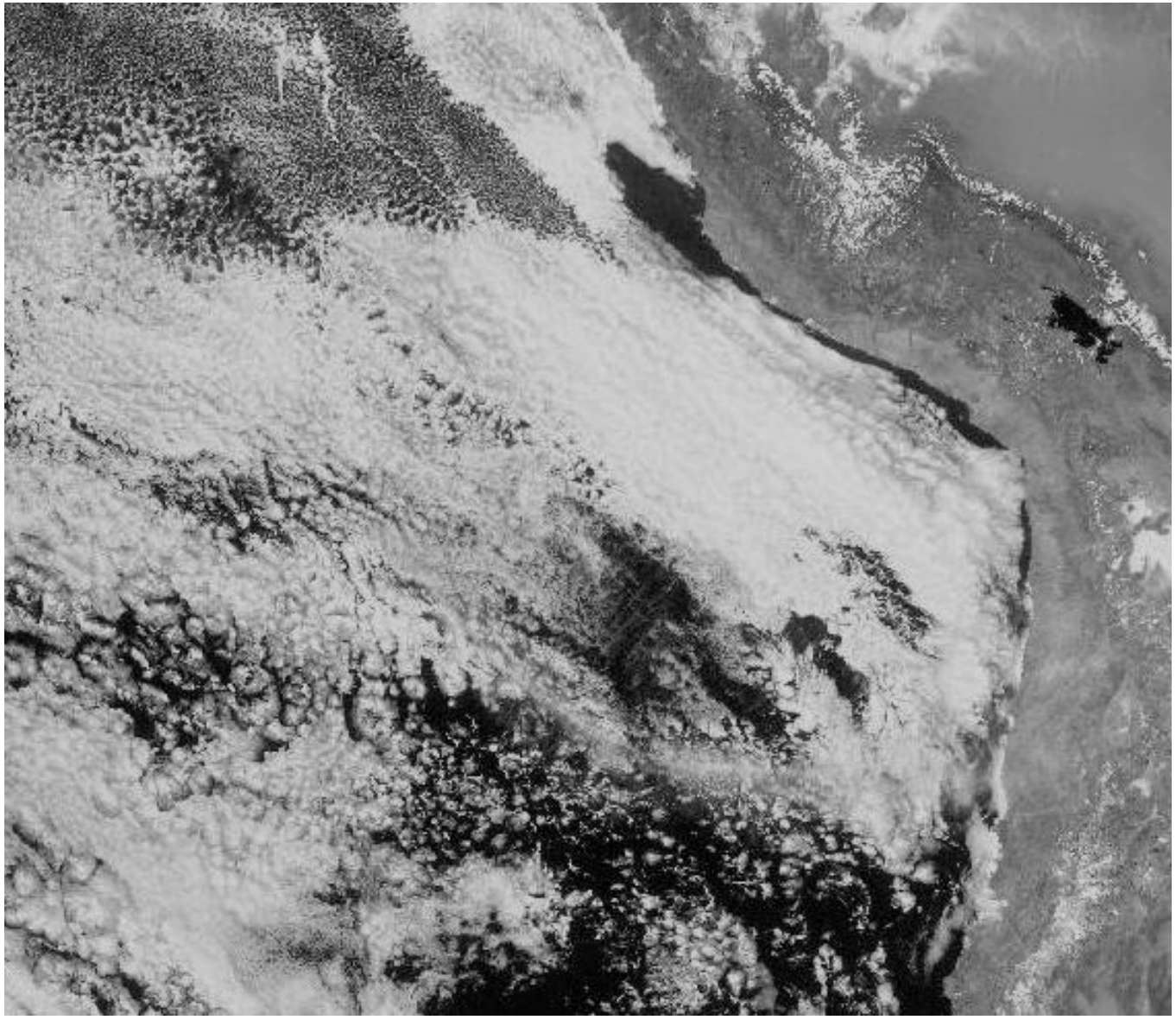
mean(Effect) = −2.5164

$$\frac{2.5 + \text{mean(Effect)}}{2.5} = -0.00656$$


Stim1i+2.5
Stim2i
Stim3i−2.5
4
2
0
−2
−4
0
20
40
60
80
100
i

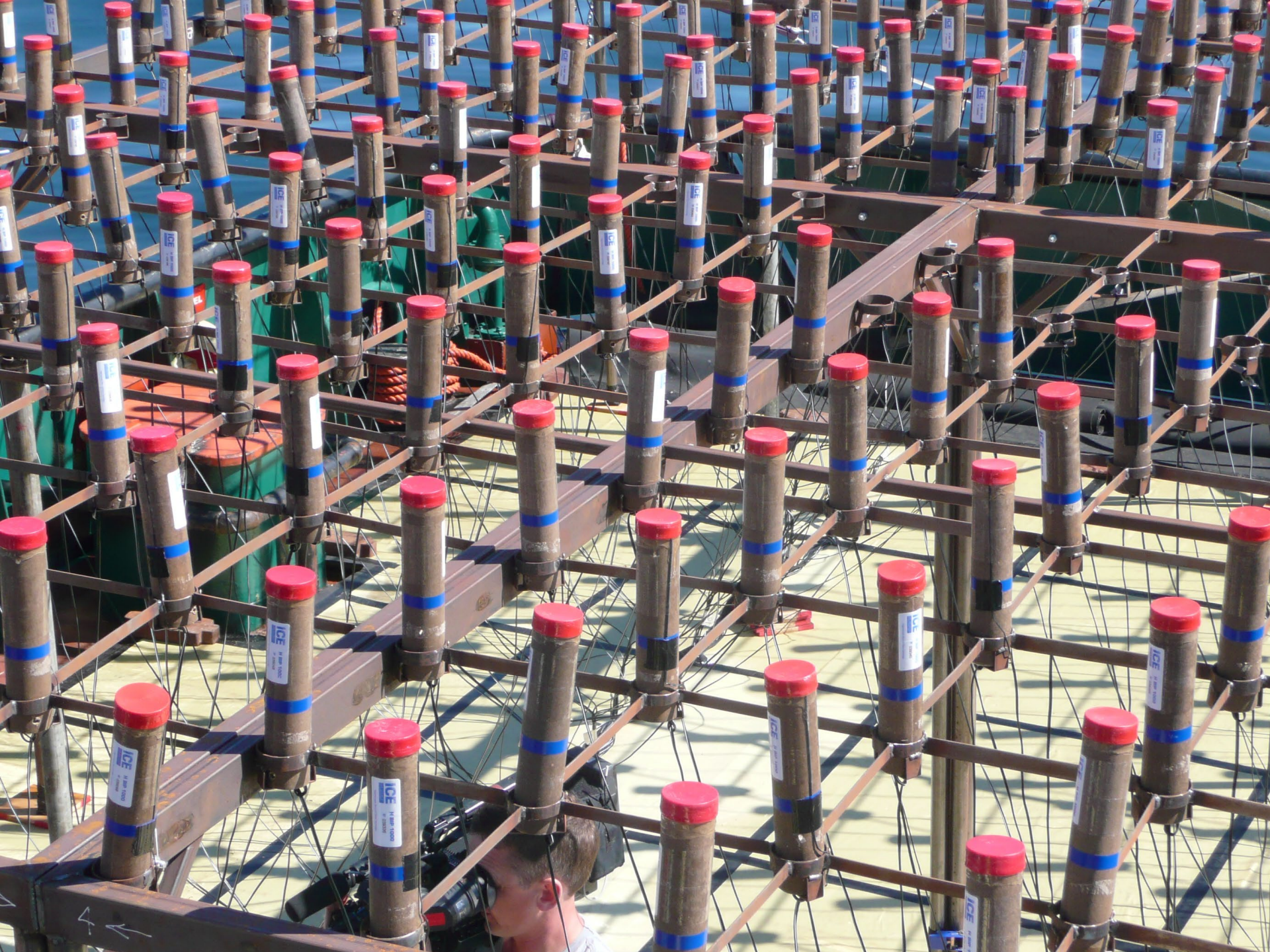

KmixP2j
KmixP1j
Kmix0j
KmixM1j
KmixM2j
0.3
0.2
0.1
0
– 0.1
– 0.2
– 0.3
0
2
4
6
8
10
j





Field2

MAVEA

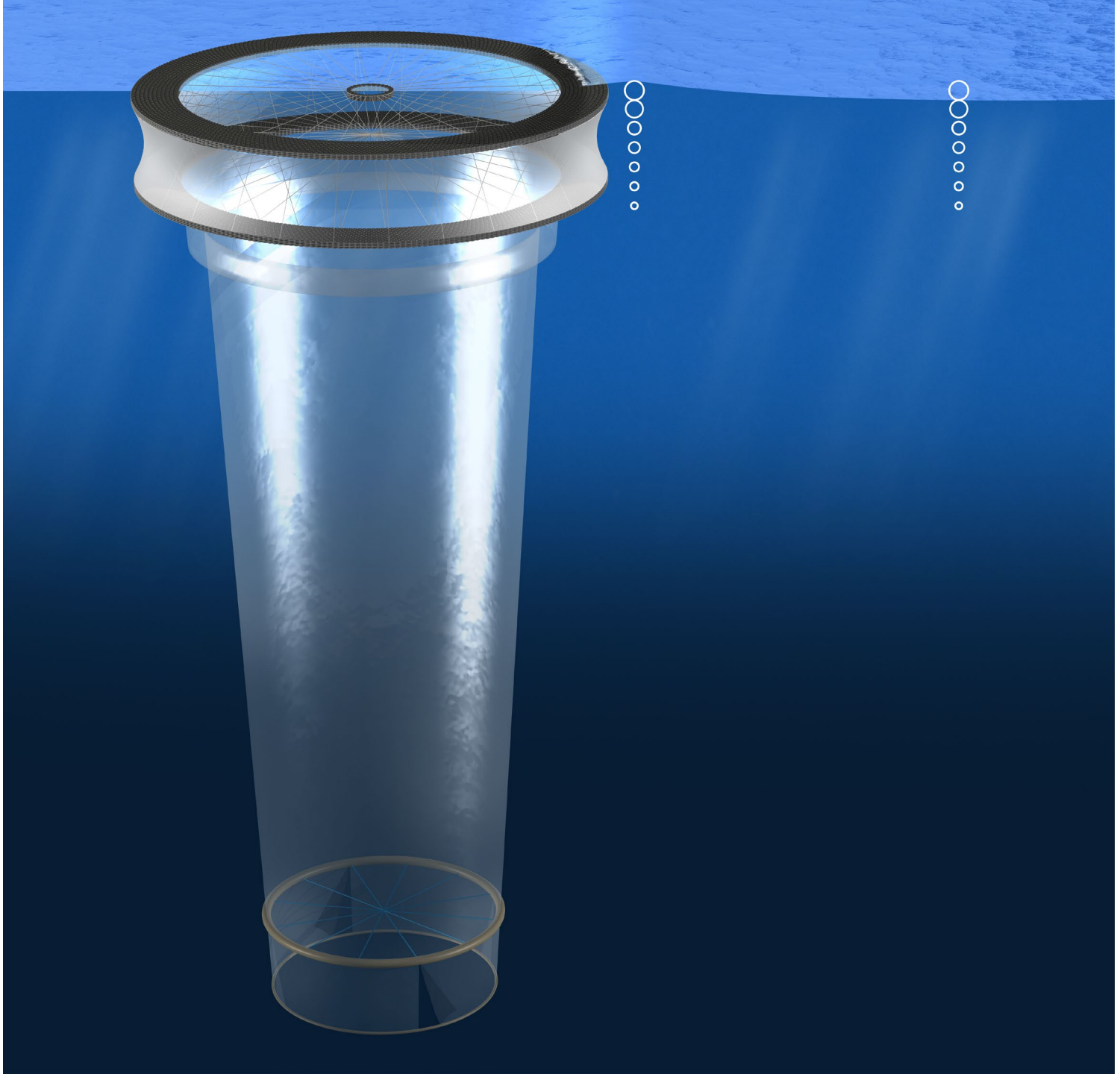


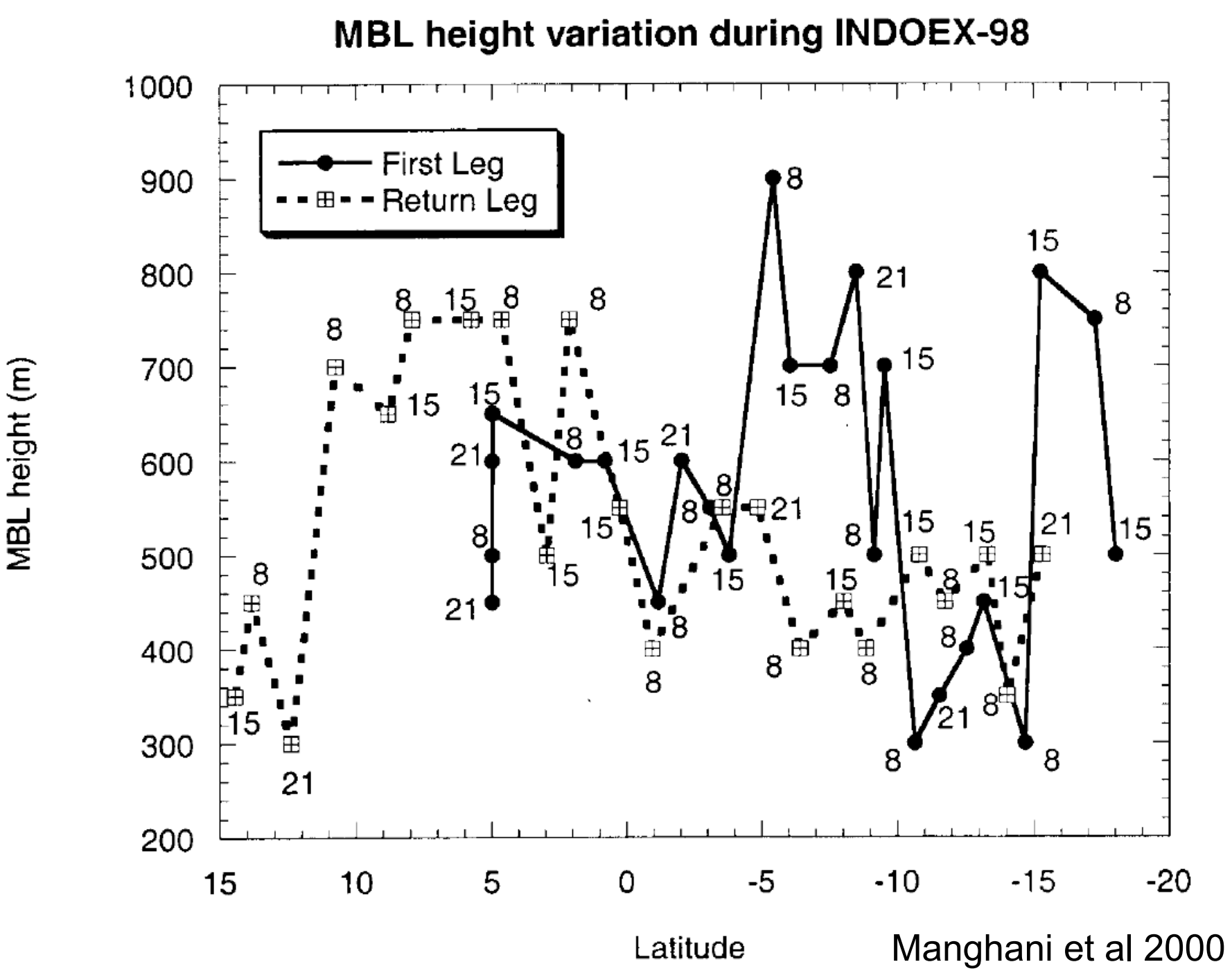

NORTH STAR
NORTH STAR

http://www.see.ed.ac.uk/~shs

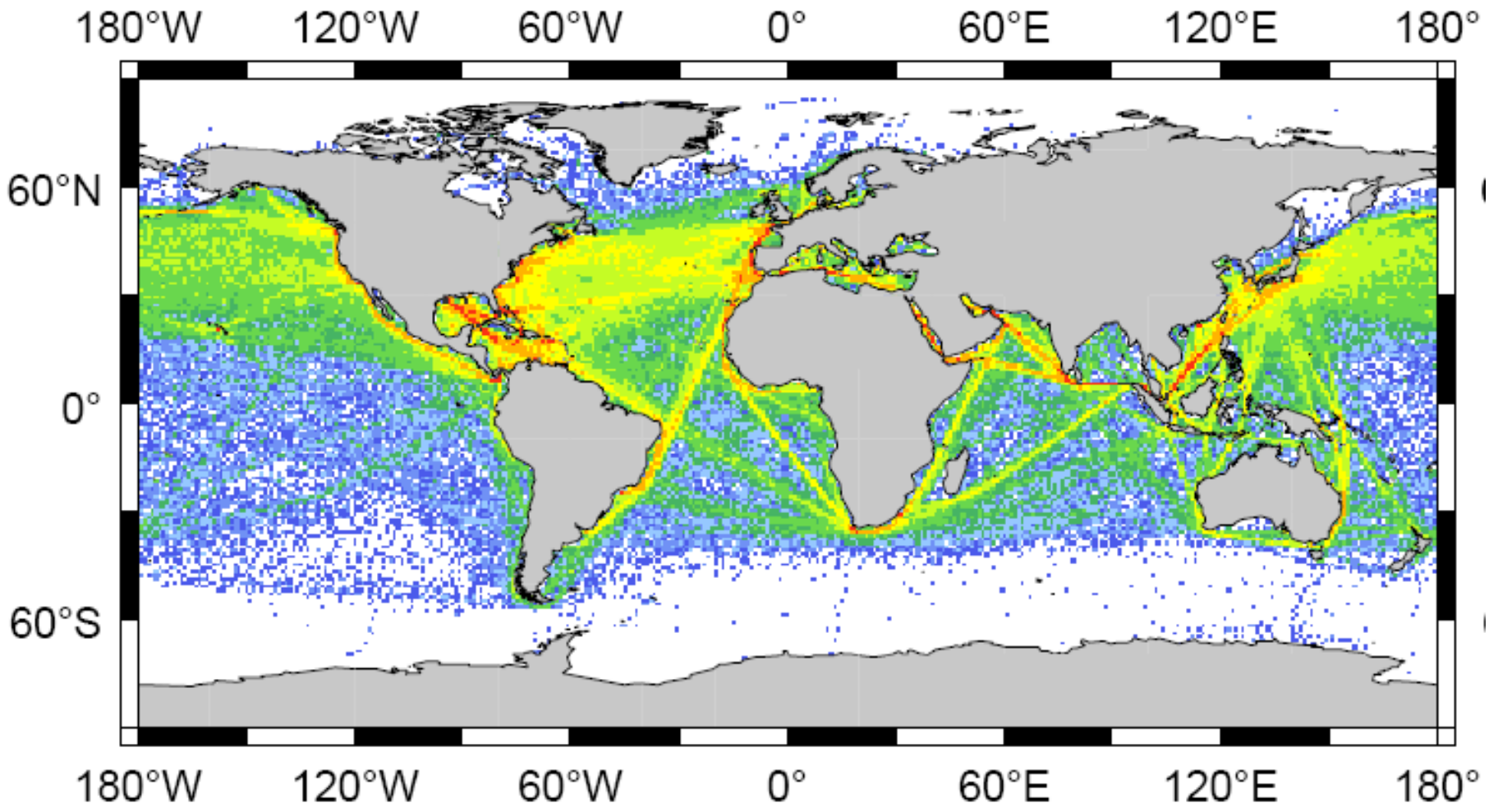
Then browse to Climate change.


This is the neighboring ranch, La Inmaculada.

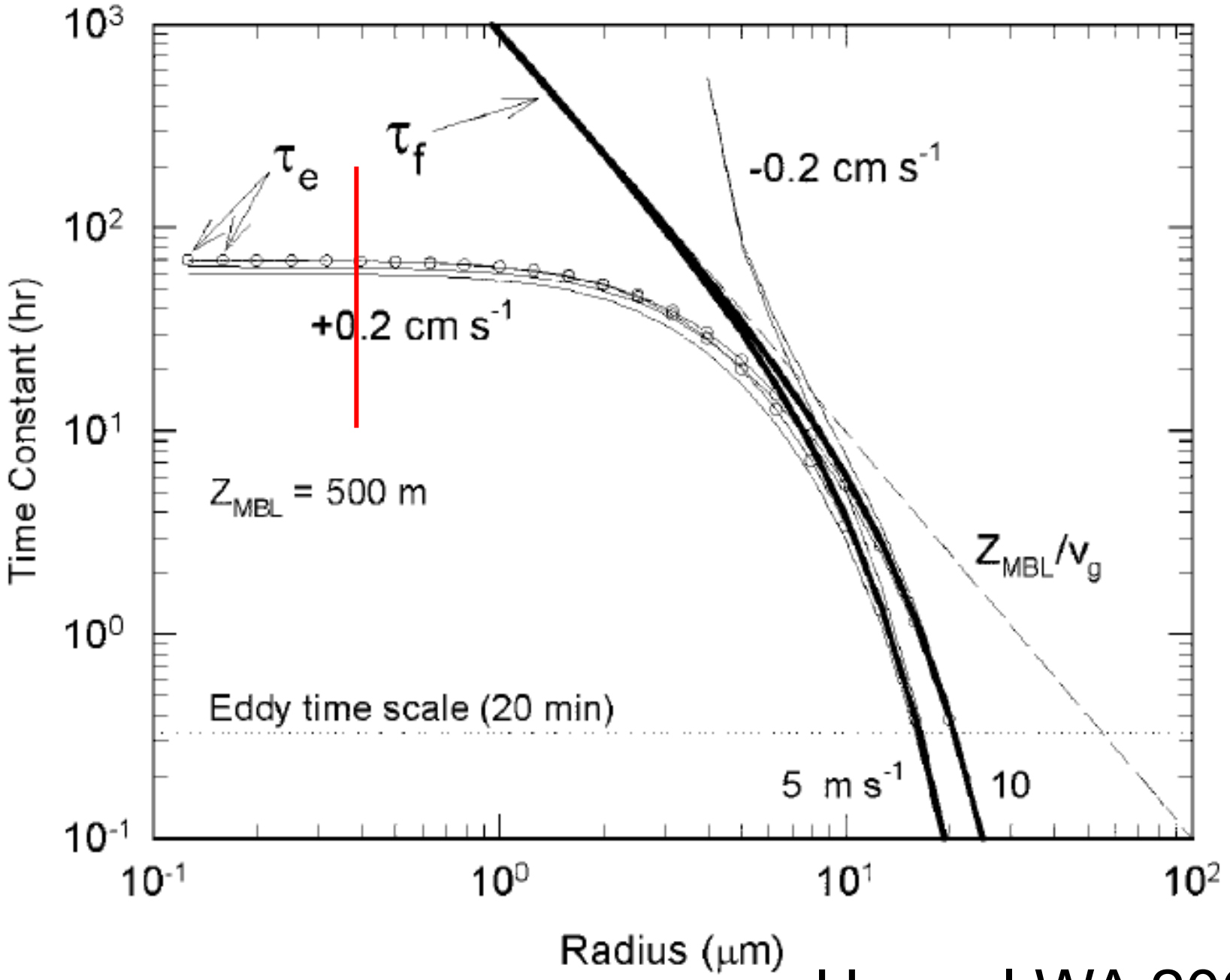




Manghani et al 2000



Axel Lauer et al. 2007 Atmos. Chem. & Phys. 0.19 to 0.6 W/m2



Hoppel WA 2002