Stefano Dolci

ENEA (Italy)

The feasibility study for a GRAVEL RUNWAY near M. Zucchelli Station (ITA)

*8th **A**ntarctic **M**eteorological **O**bservations, **M**odeling & **F**orecasting **W**orkshop*

June 9-12, 2013 – Madison WI (USA)

Why a gravel runway?

Because it improves the efficiency of the operations

Because it allows financial savings

Because it reduces the fuel burned and *carbon footprint*

Because it increases the emergency response capability

WHY A GRAVEL RUNWAY?

Because it improves the efficiency of the operations

ENEA begun sea-ice operations on 1989, but:

temperature increases
(3°C of the permafrost in 10 years)

shortening of the Campbell
(5 km on 2006/07)

the expected duration of the ice runway is not guaranteed, hence

It may be impossible to perform the whole program

WHY A GRAVEL RUNWAY?

Because it improves the efficiency of the operations

ENEA begun blue-ice operations on 2006, but:

increased water streaming in summer, associated with reduced wind ablation in winter …

don't deliver a flat surface in November, hence

it may be impossible to perform the whole program

WHY A GRAVEL RUNWAY?

OVERVIEW OF THE INTERCONTINENTAL RUNWAYS

WHY A GRAVEL RUNWAY?

OVERVIEW OF THE INTERCONTINENTAL RUNWAYS

- **Ice runways**:

RUNWAY	NATION	LATITUDE / ALTITUDE	STATUS
McMurdo	USA	lat. 78°S / alt. 0 m	**problem**
Casey (Wilkins)	AUS	lat. 67°S / alt. 700 m	**problem**
Novolazarevskaja	RUS/ALCI	lat. 71°S / alt. 100 m	**problem**
Troll	NOR	lat. 72°S / alt. 1300 m	no problem
Union Glacier	ALE	lat. 80°S / alt. 750 m	no problem
Sky Blue	UK	lat. 75°S / alt. 1350 m	no problem

- **Gravel runways**:

RUNWAY	NATION	LENGHT
Frei	Cile	1300 m
Marambio	Argentina	1300 m
Rothera	Regno Unito	900 m

WHY A GRAVEL RUNWAY?

Because it allows financial savings

ENEA uses ship ITALICA to:

Carry fuel	*biennial activity*
Carry freights	*biennial activity*
Carry out oceanographic campaign	*biennial activity*
Carry personnel	*annual activity*

ITALICA costs per campaign **6,000,000 €** (transport of 90 pax)

Hercules costs per campaign **2,000,000 €** (transport of 90 pax)

6,000,000 – 2,000,000 = **4,000,000 €** *biennial saving*

WHY A GRAVEL RUNWAY?

Because it reduces the fuel burned and *carbon footprint*

ITALICA burns **300 ton MGO** (1) per voyage (transport of 90 pax)
Hercules burns **30 ton Jet A-1** per flight (transport of 45 pax)

1. MGO = **M**arine **G**as **O**il

1 ton of **fuel** produces about **30 ton of CO_2**

carrying the same number of personnel by air rather than by ship produces a saving of 4/5 of the CO_2 emission

WHY A GRAVEL RUNWAY?

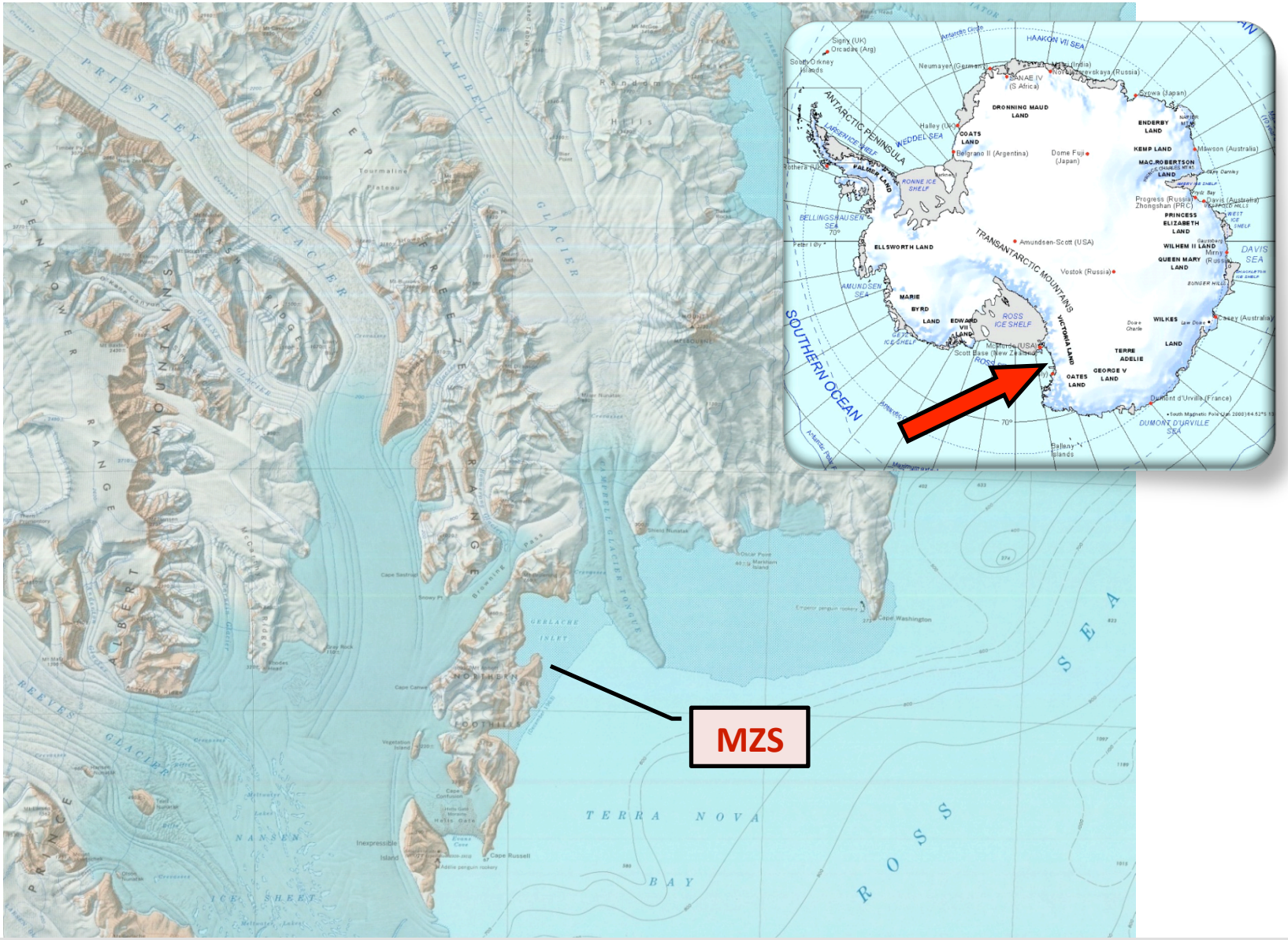
Because it increases the emergency response capability

having a runway available
all year round,
obviously, increases the:

emergency response of the stations supported by the runway

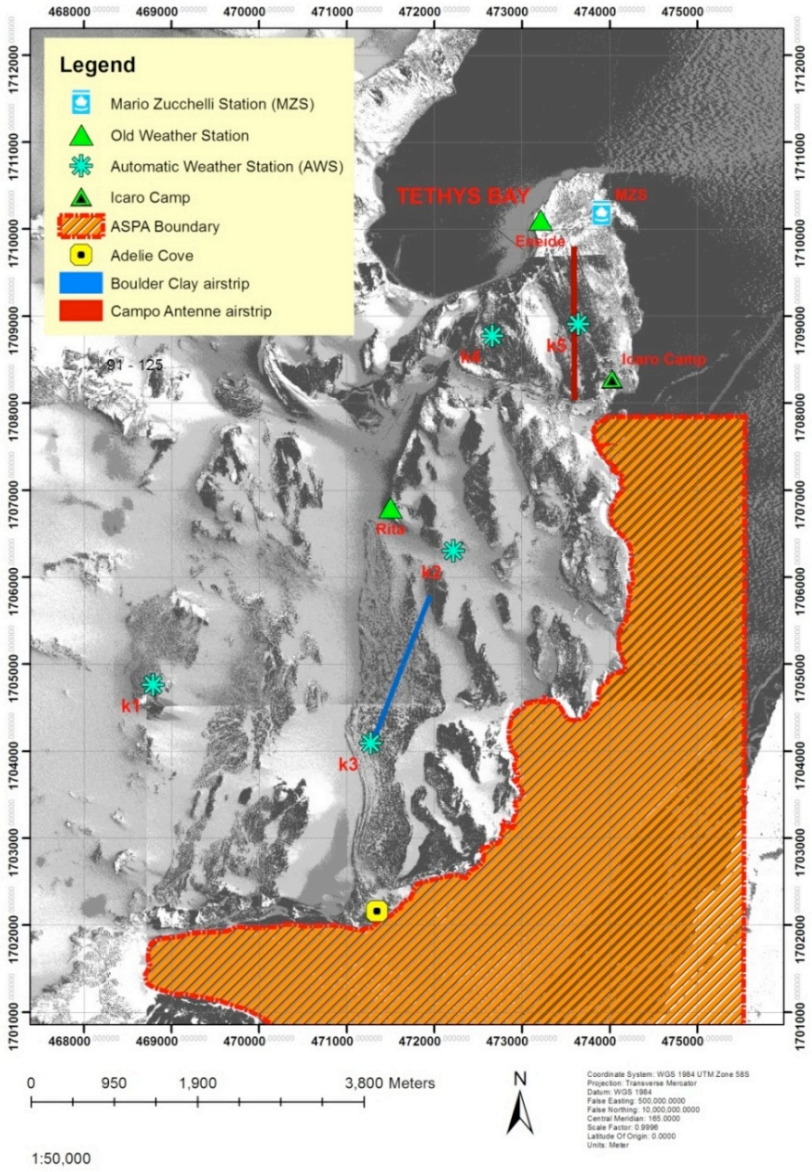
safety for any air operation in the pertinent area

Where a gravel runway?



Where a gravel runway?

Where a gravel runway?



"*Campo Antenne*" airstrip option

pros

nearest to MZS (about 1,5 Km)
granitic outcrop surface

cons

Heavy construction work ("cut and fill" technique)
bigger enbarkment volume (1.200.000 m3)
imply relocation of MZS *antenna farm* area

"*Boulder Clay*" airstrip option

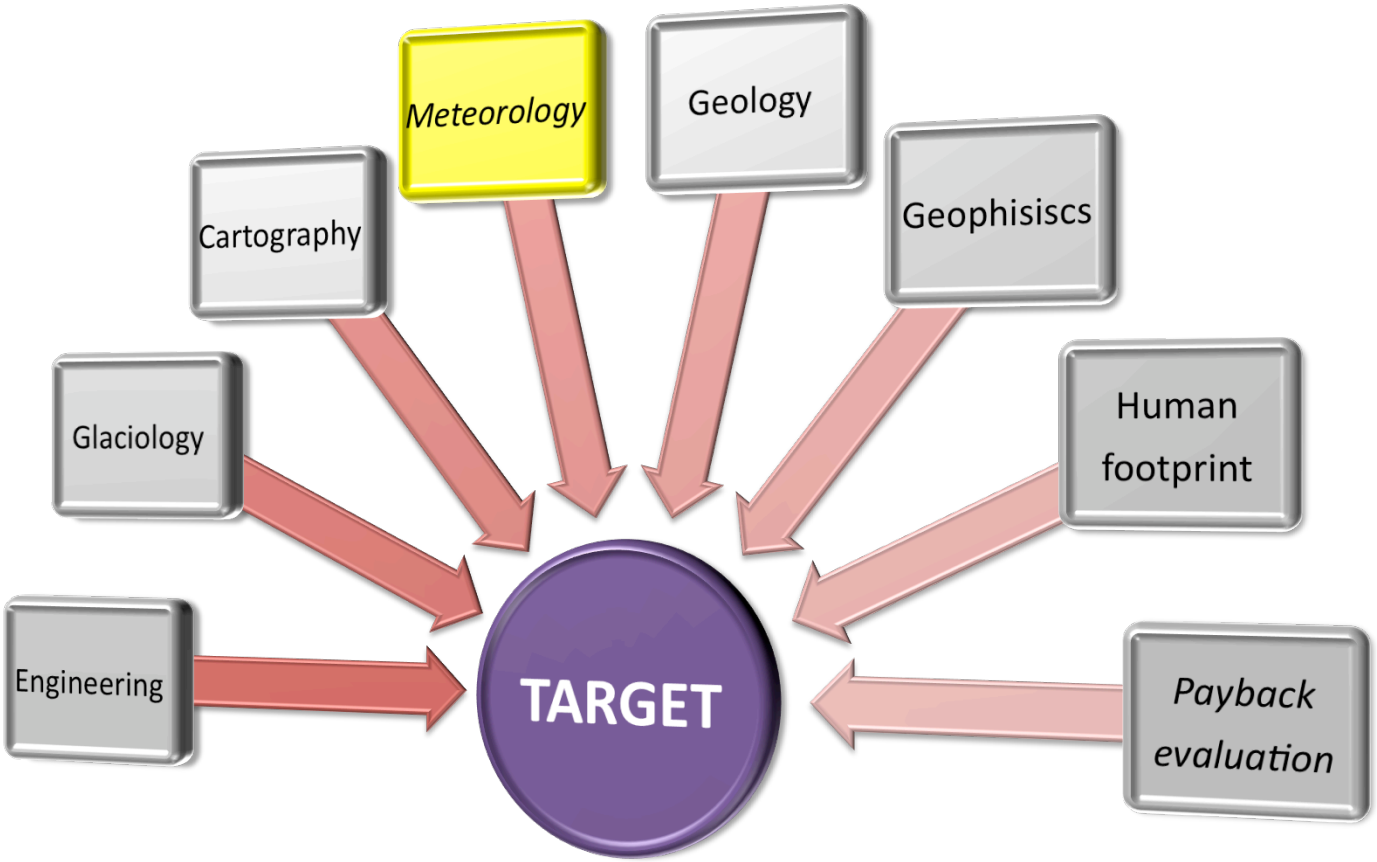
pros

needs less construction resources
"only" a relocation of soil material (400.000 m3)

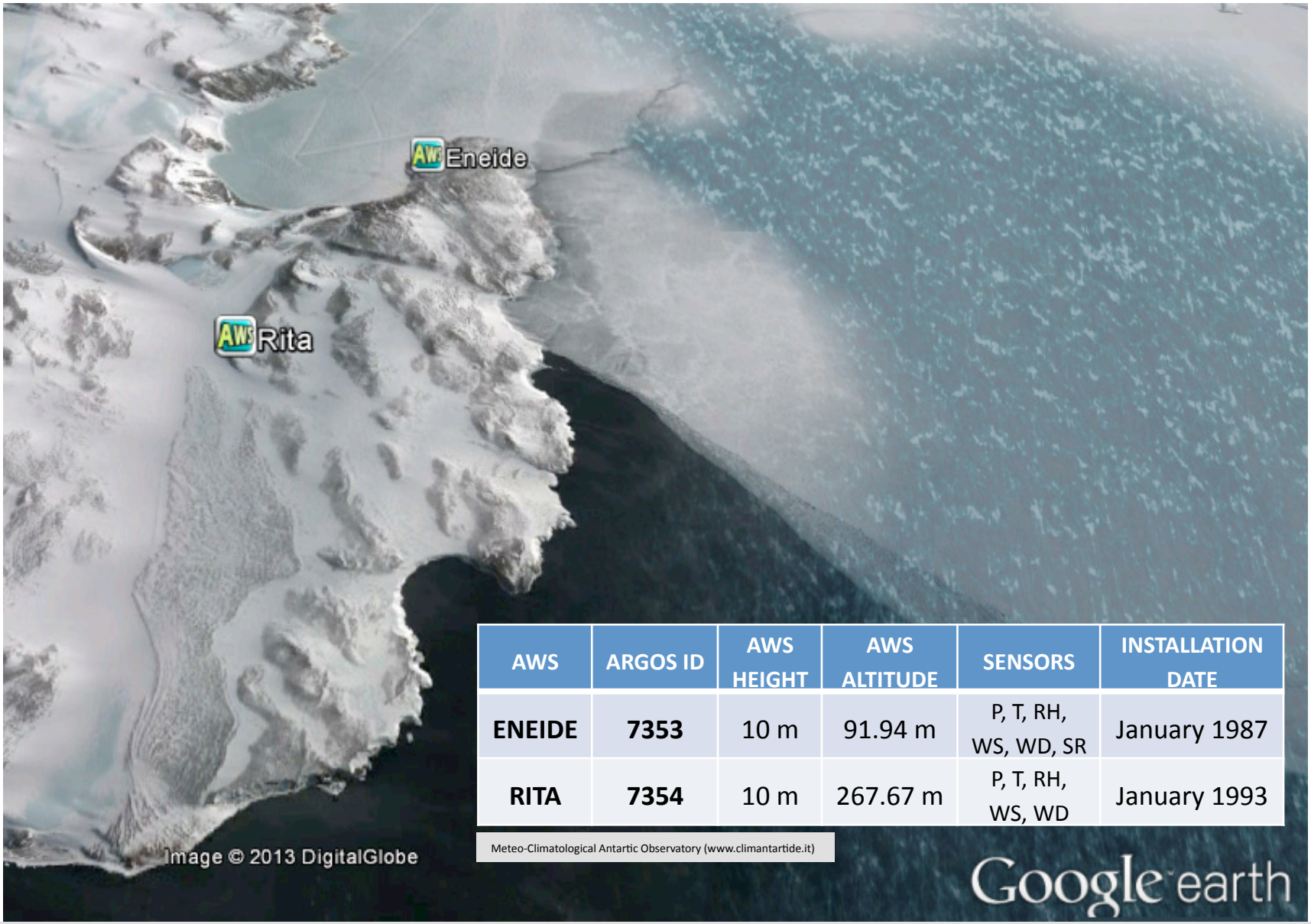
cons

farest from MZS (about 6 km)
till moraine deposit surface

THE FEASIBILITY STUDY



THE FEASIBILITY STUDY: *Meteorology*

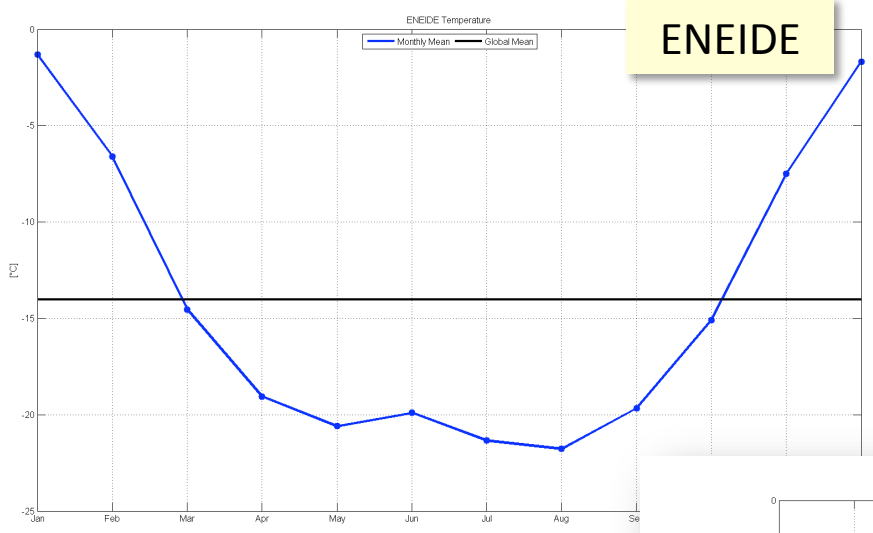


AWS	ARGOS ID	AWS HEIGHT	AWS ALTITUDE	SENSORS	INSTALLATION DATE
ENEIDE	**7353**	10 m	91.94 m	P, T, RH, WS, WD, SR	January 1987
RITA	**7354**	10 m	267.67 m	P, T, RH, WS, WD	January 1993

Meteo-Climatological Antartic Observatory (www.climantartide.it)

THE FEASIBILITY STUDY: *Meteorology*

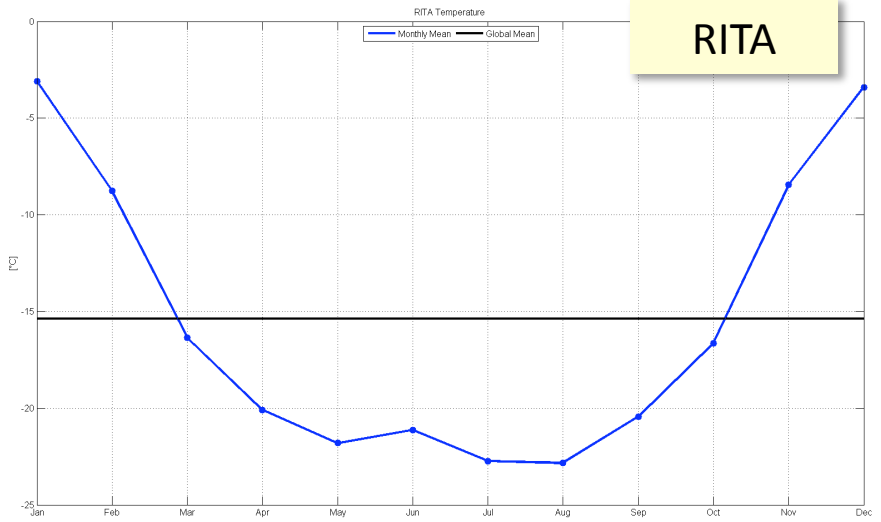
ENEIDE



Meteo-Climatological Antartic Observatory (www.climantartide.it)

T

RITA

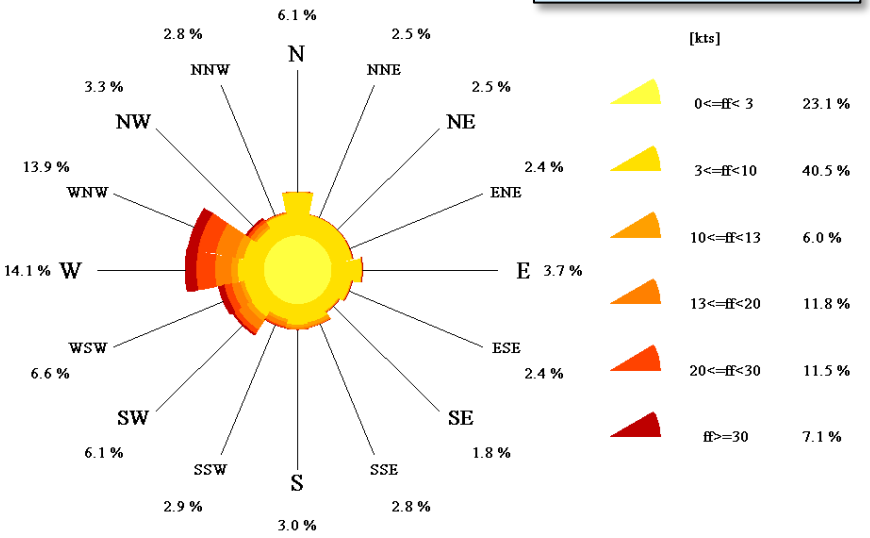


Meteo-Climatological Antartic Observatory (www.climantartide.it)

THE FEASIBILITY STUDY: *Meteorology*

AWS eneide from October to February

Area proportional to data percentage



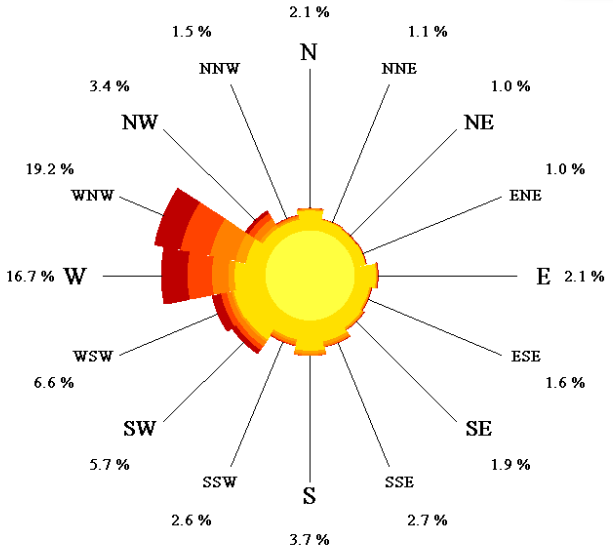
ENEIDE
austral **summer**

Meteo-Climatological Antartic Observatory (www.climantartide.it)

WS WD

AWS eneide from March to September

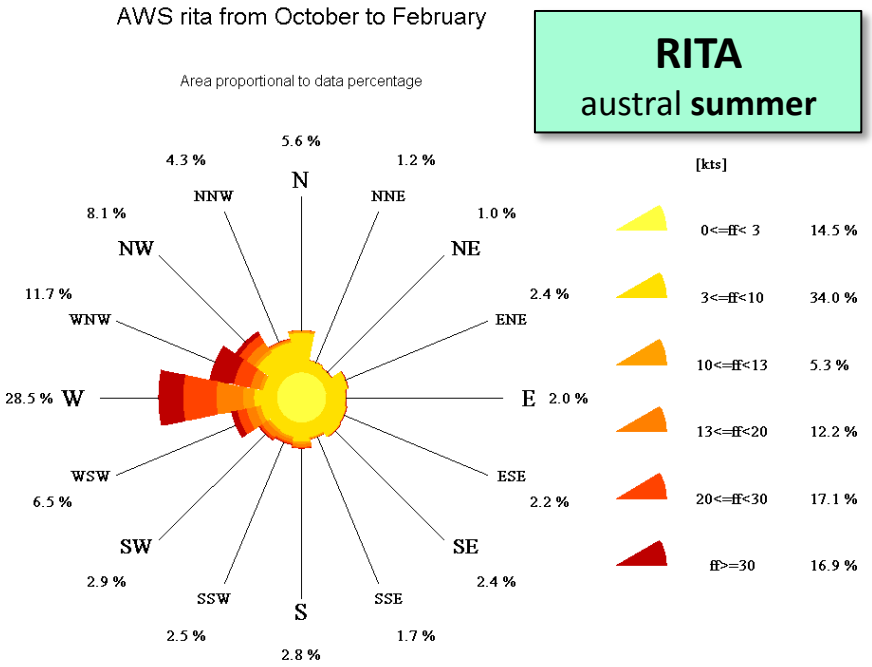
Area proportional to data percentage



ENEIDE
austral **winter**

Meteo-Climatological Antartic Observatory (www.climantartide.it)

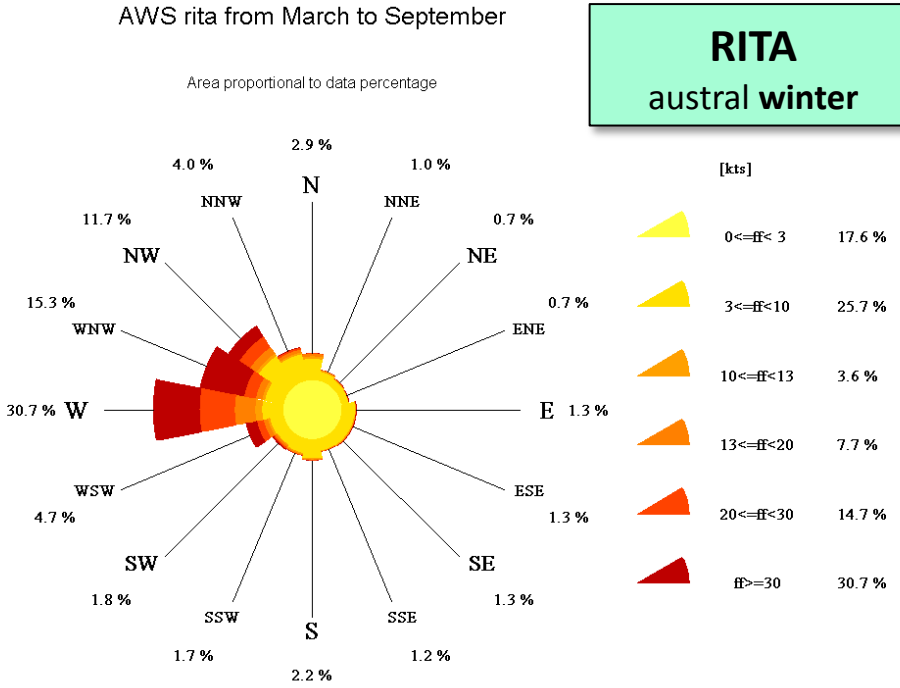
THE FEASIBILITY STUDY: *Meteorology*



RITA
austral **summer**

Meteo-Climatological Antartic Observatory (www.climantartide.it)

WS WD



RITA
austral **winter**

Meteo-Climatological Antartic Observatory (www.climantartide.it)

THE FEASIBILITY STUDY: *Meteorology*

CAMPBELL Glacier

PRIESTLEY Glacier

REEVES Glacier

Drygalski

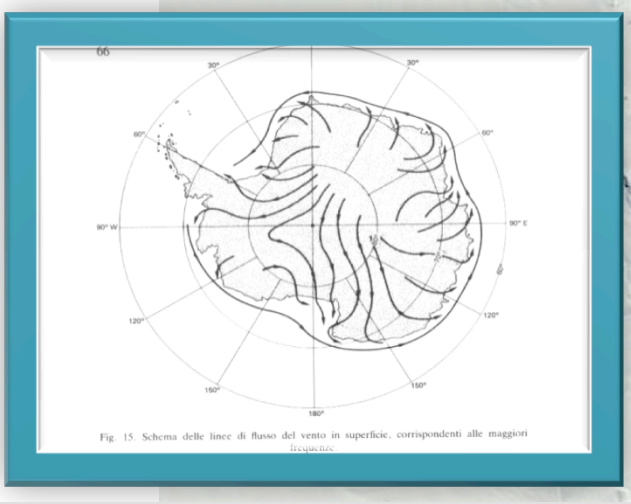
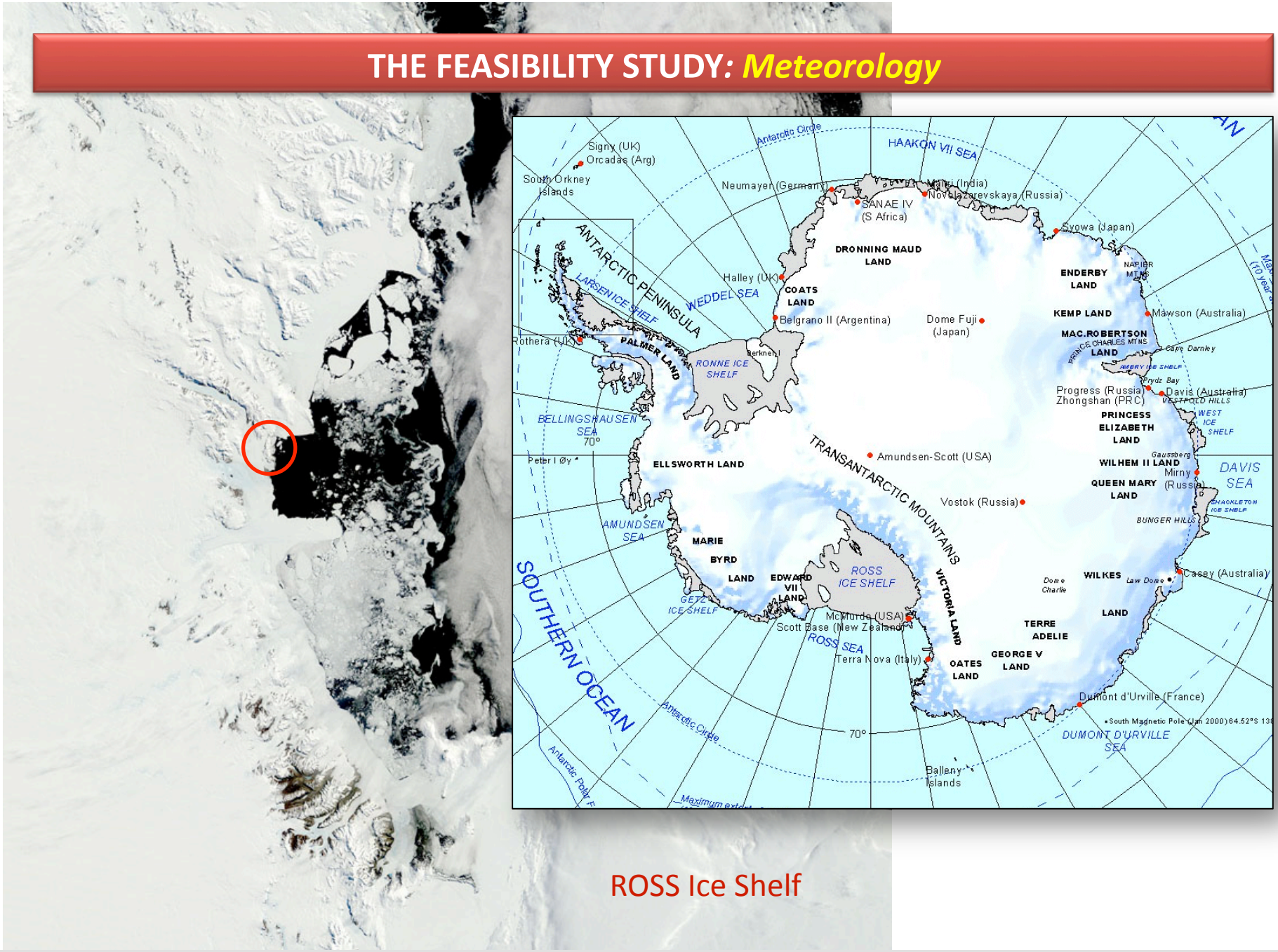


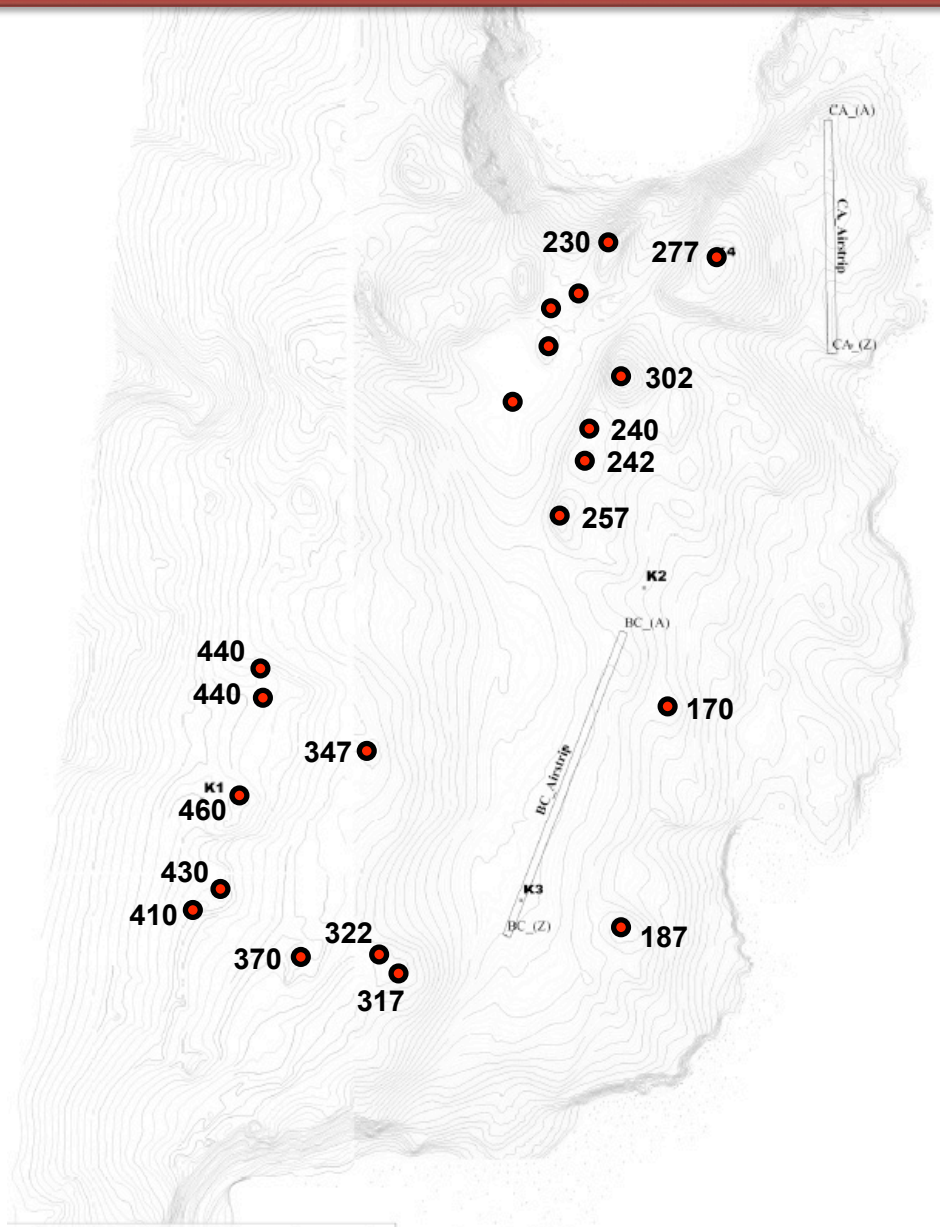
Fig. 15. Schema delle linee di flusso del vento in superficie, corrispondenti alle maggiori frequenze.

THE FEASIBILITY STUDY: *Meteorology*



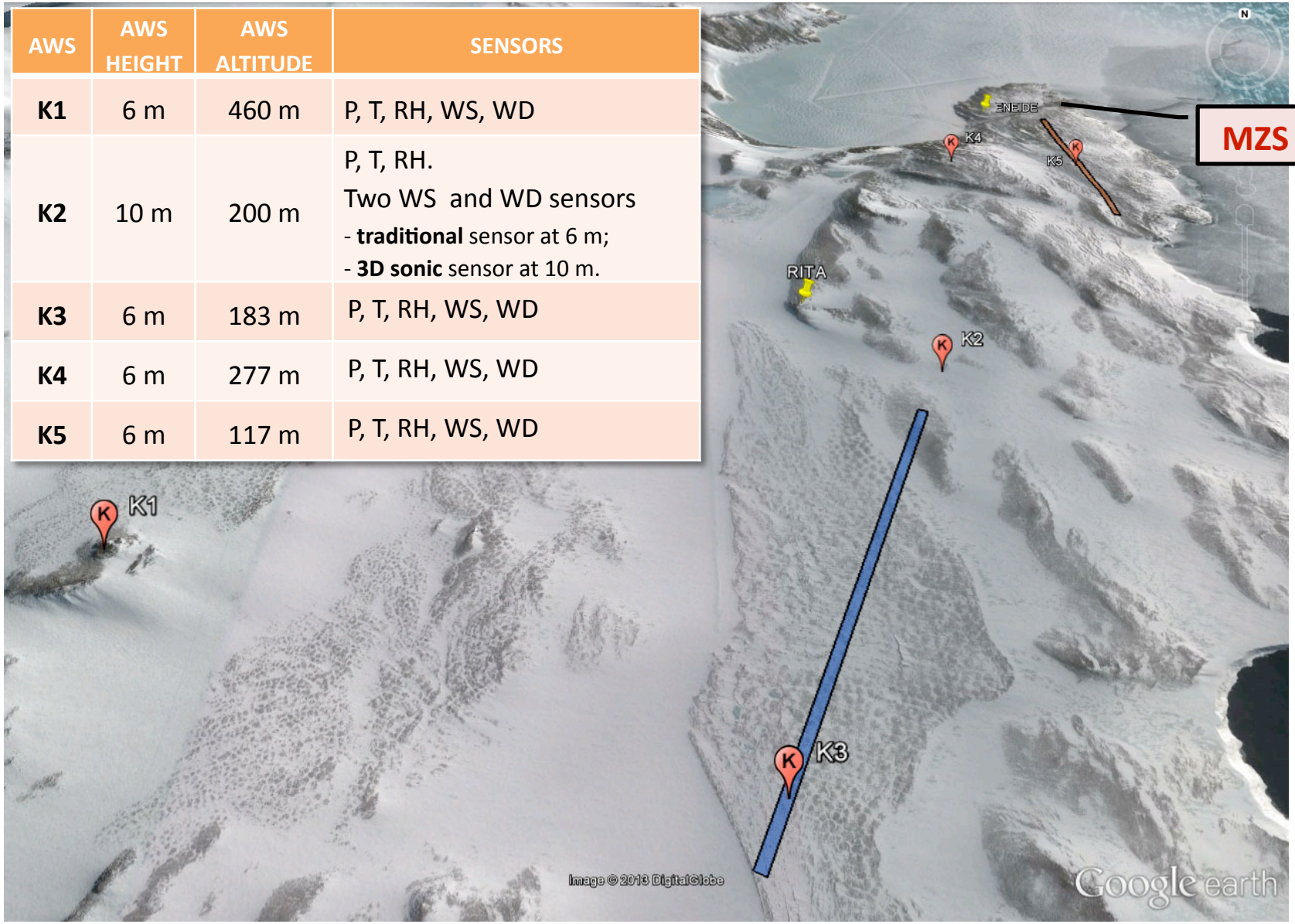
ROSS Ice Shelf

THE FEASIBILITY STUDY: *Meteorology*



THE FEASIBILITY STUDY: *Meteorology*

AWS	AWS HEIGHT	AWS ALTITUDE	SENSORS
K1	6 m	460 m	P, T, RH, WS, WD
K2	10 m	200 m	P, T, RH. Two WS and WD sensors - **traditional** sensor at 6 m; - **3D sonic** sensor at 10 m.
K3	6 m	183 m	P, T, RH, WS, WD
K4	6 m	277 m	P, T, RH, WS, WD
K5	6 m	117 m	P, T, RH, WS, WD



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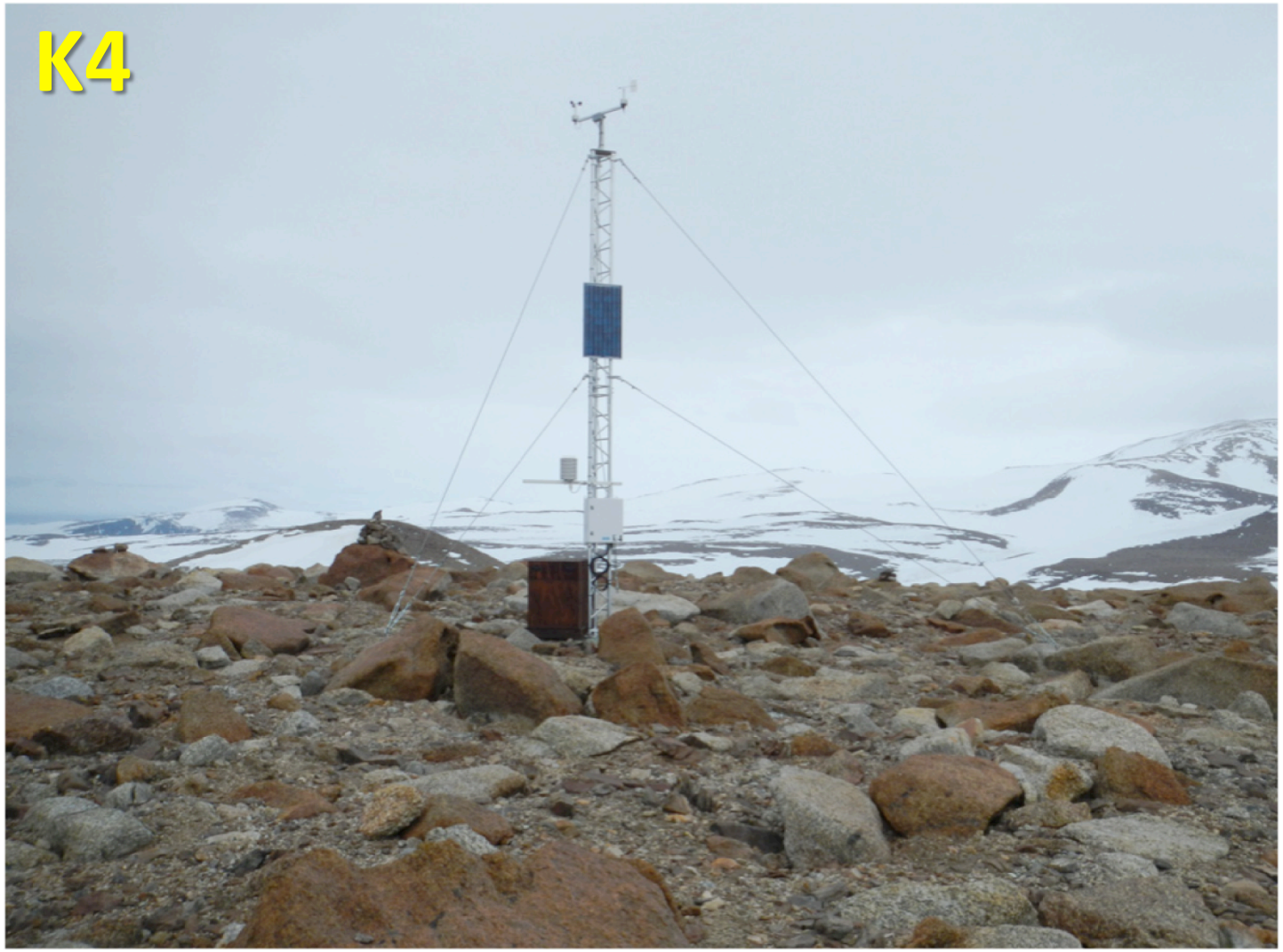

THE FEASIBILITY STUDY: *Meteorology*


Thanks for your attention…