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# UPDATES ABOUT THE PROJECT OF A GRAVEL RUNWAY NEAR M. ZUCCHELLI STATION (ITA)

*10th AMOMFW | Scott Polar Research Institute (Cambridge – UK) | June 17 – 19, 2015*

# WHY

## CONSTRAINTS

- reduction of logistical costs in favour of research activities funding (*international guidelines*)
- reducing period of availability of fast ice runway in Gerlache Inlet (Terra Nova Bay)

## NEEDS

- Long term solution facility for personnel and materials trasportation
- minimize impact on antarctic Programs of other countries

## ADVANTAGES

- represents a common facility for Antarctic Programs established in Ross Sea region
- Increase of safety for Antarctic Programs established in Ross Sea region
- Reduction of environmental impact
- Reduction of national expedition logistic cost

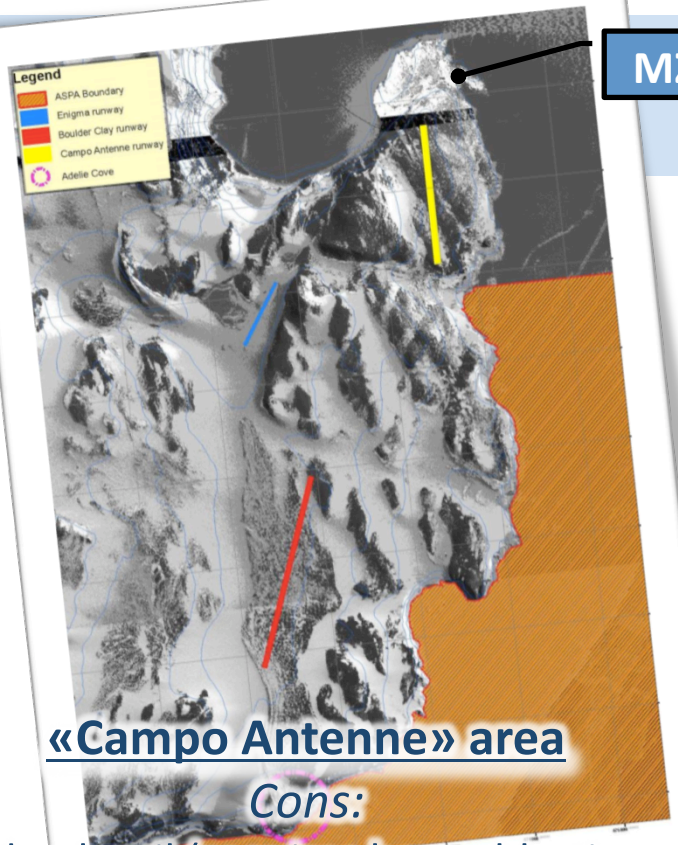
# WHERE (I)

## ALTERNATIVES

**Nansen Glacier**

*Cons:*

- Far from MZS (about 50 km)
- Route to the airstrip crosses for few kilometers a crevassed glacier
- Flatness of airstrip surface was degraded year by year by climate changes in the area (fresh water puddles and streams)

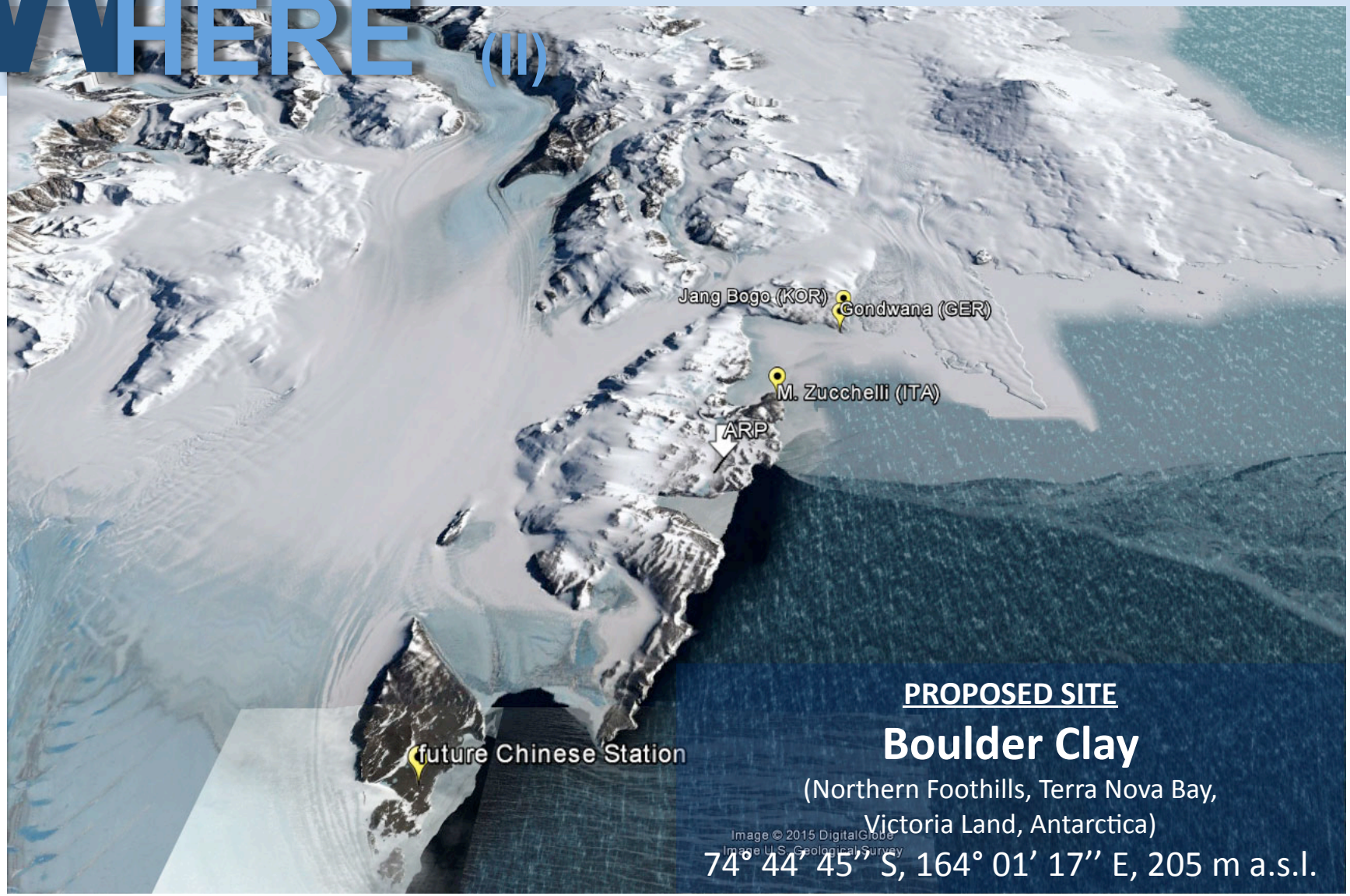



**«Campo Antenne» area**

*Cons:*

- Bedrock soil (requires heavy blasting work)
- Extended volume of material movement
- Runway of limited lenght (1.700 m)
- Huge repositioning activity of large antennas

# WHERE (II)



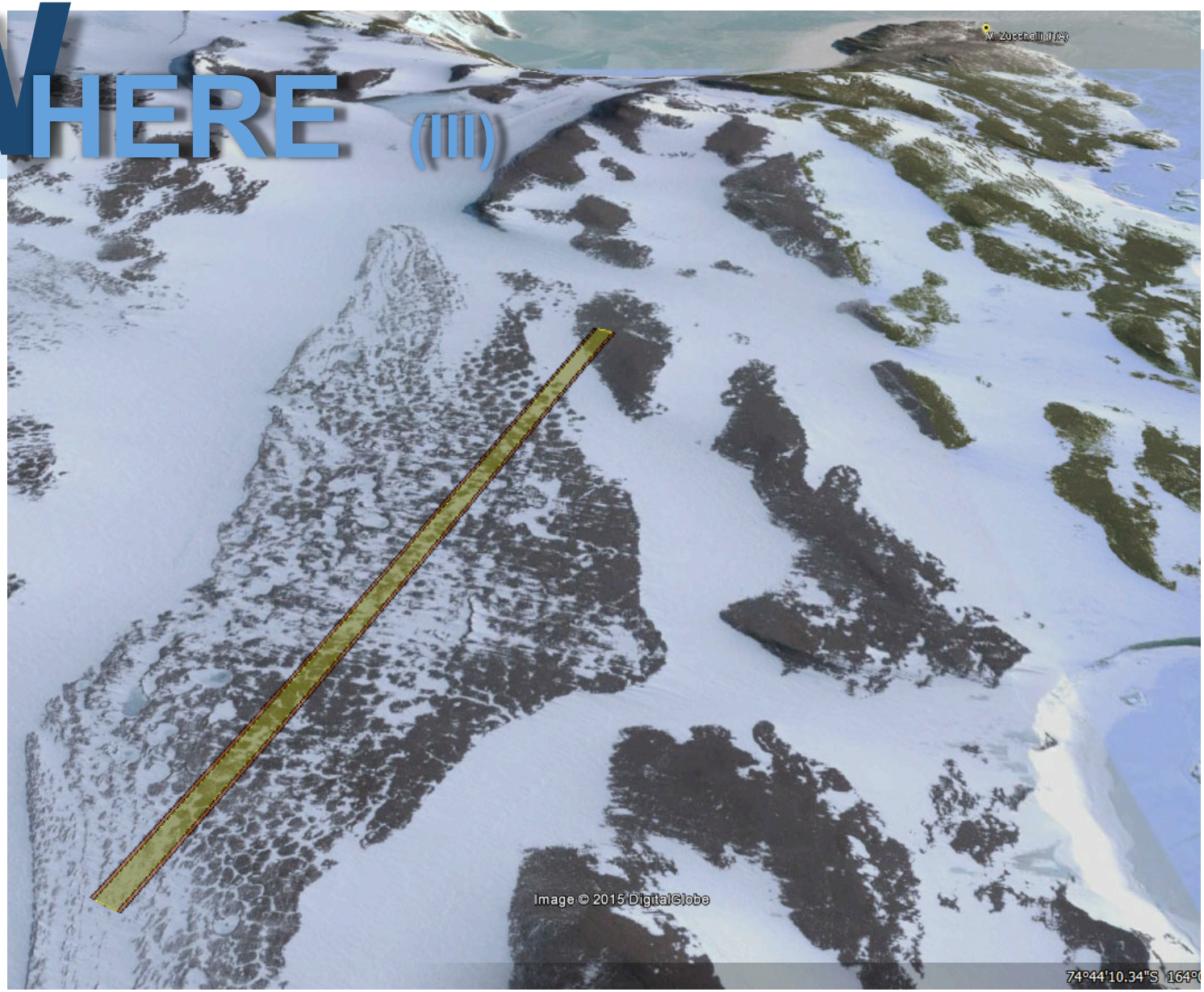

**PROPOSED SITE**

## Boulder Clay

(Northern Foothills, Terra Nova Bay, Victoria Land, Antarctica)

74° 44’ 45’’ S, 164° 01’ 17’’ E, 205 m a.s.l.

# WHERE (III)



# WHERE (IV)

**VEGETATION**

Very scarce (less than 5%), composed mainly of mosses and epilithic lichens

**FAUNA**

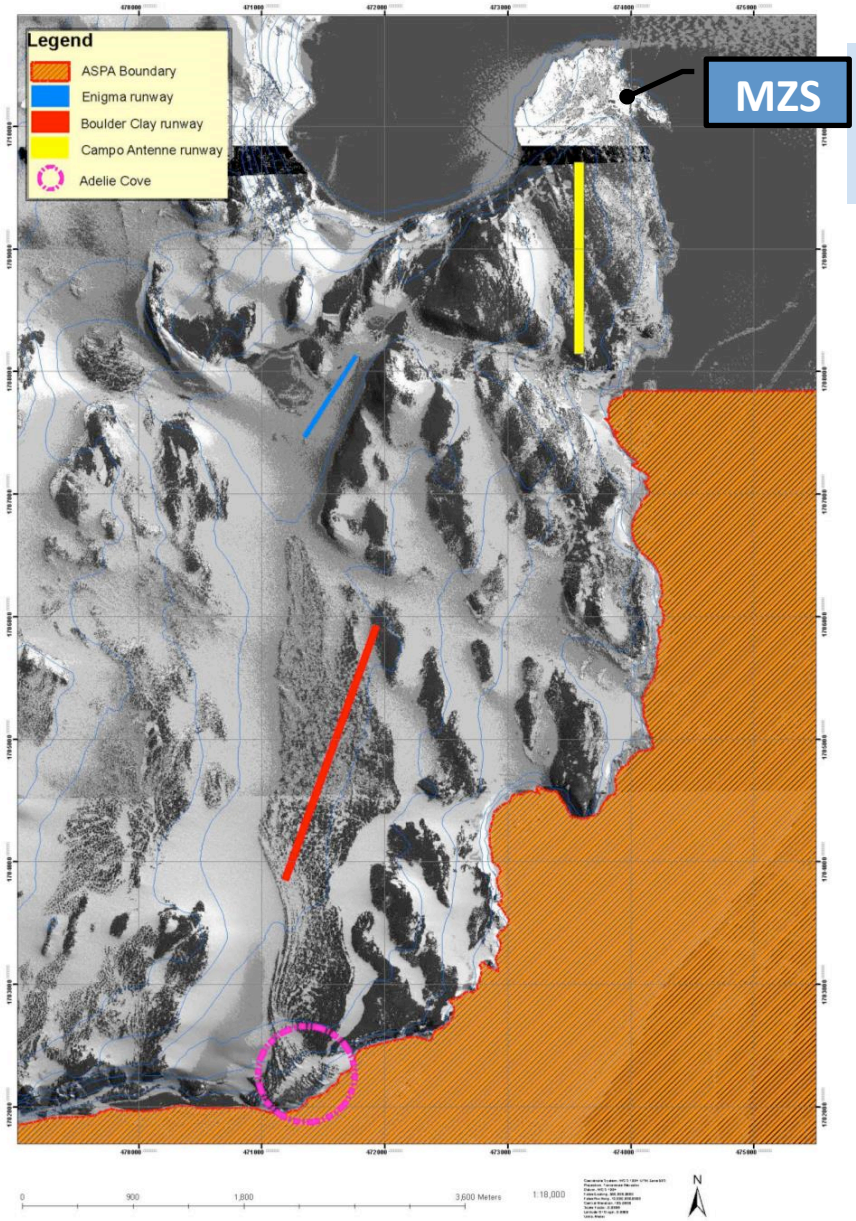
**Antarctic skuas** and **Adélie penguins**

no colonies or habitats of any species within 1,8 Km with respect to the borders of the proposed facilities

*Aircraft path for landing and taking-off will be kept off the Adelie Cove area*

*In addition to important limitations in height and space flight in overpasses of ASPA[1] n. 161 area (except for safety reasons)*

1. **A**ntarctic **S**pecially **P**rotected **A**rea



# WHAT (I)

ICE CORE MORAINE

ABLATION TILL (0,4m ÷ 1,0m)

DEAD GLACIER OR BURIED GLACIAL ICE (>60m)

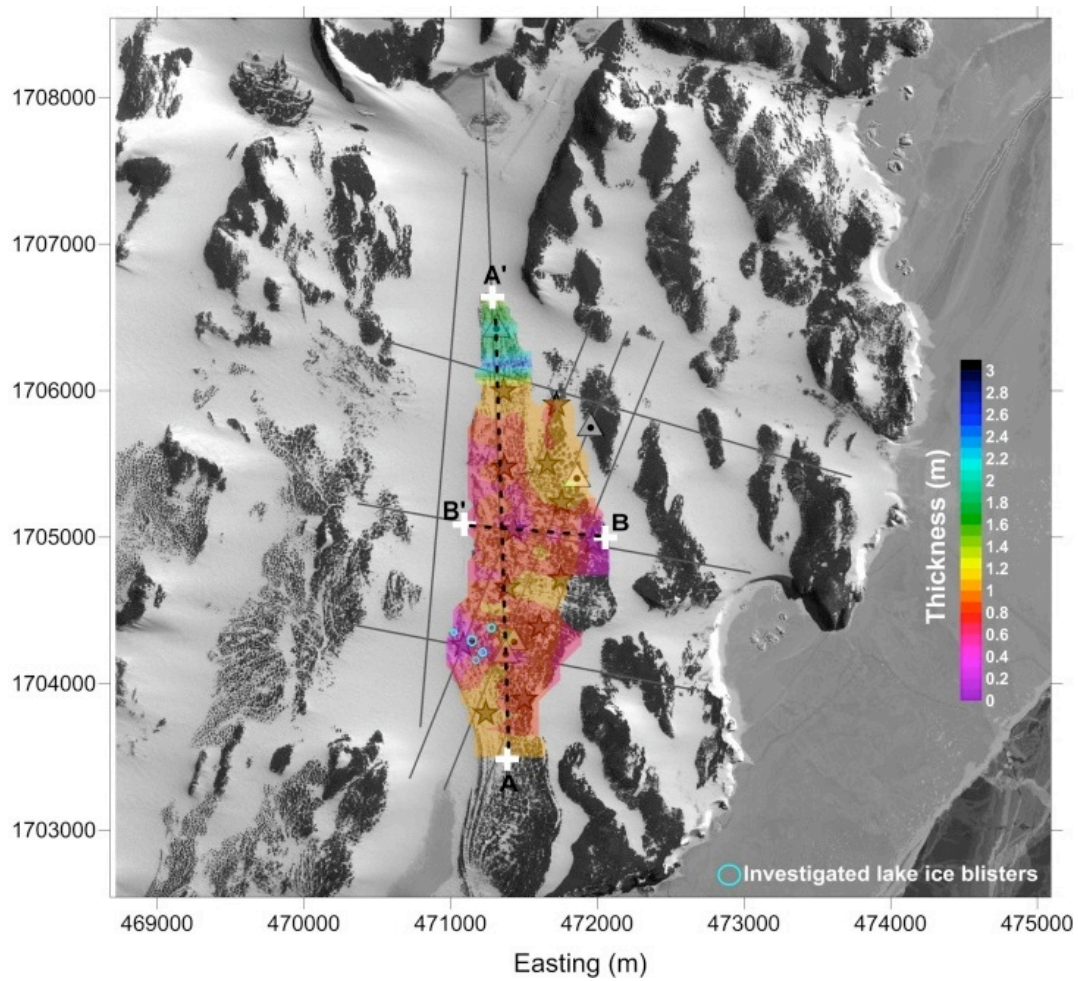
Seasonal surveys, meteorological data, interferometric satellite data, design of the opera

*Allow to assess that*

only a minor annual snow removing and small levelling adjustments are required.

<u>Approximate mean shift</u>

less than 20 mm per year



# WHAT (II)

**TERRAIN ORIGINAL SLOPE**

**Transversal**: 4 meters over a distance of 70 meters

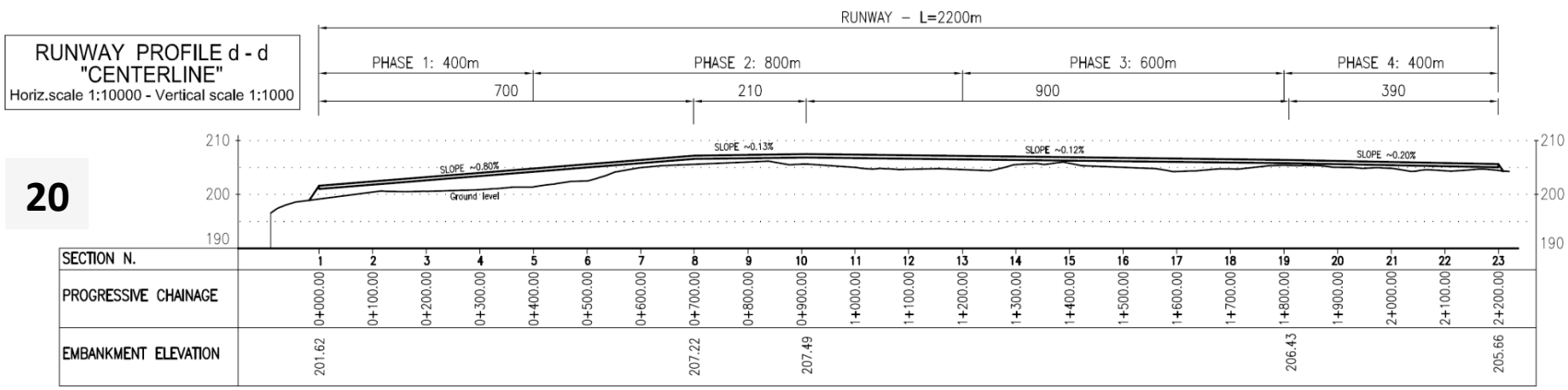
**Longitudinal**: maximum elevation difference of about 6 meters over a distance of 700 meters

**FINAL RUNWAY SLOPE**

**Transversal**: 0%

**Longitudinal**: below 0,8 % (on total lenght)

## LONGITUDINAL SECTION

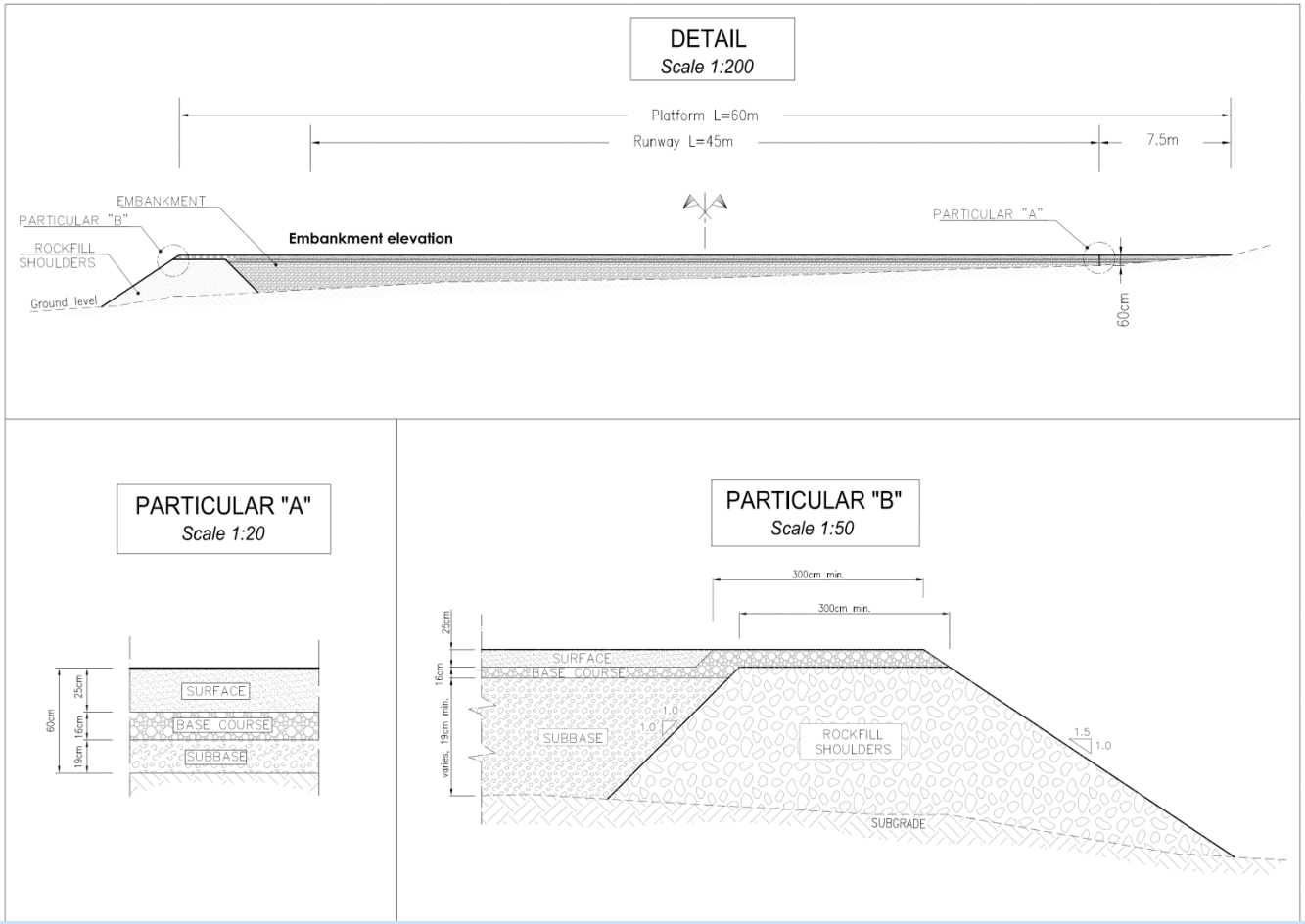



20

02

# WHAT (III)

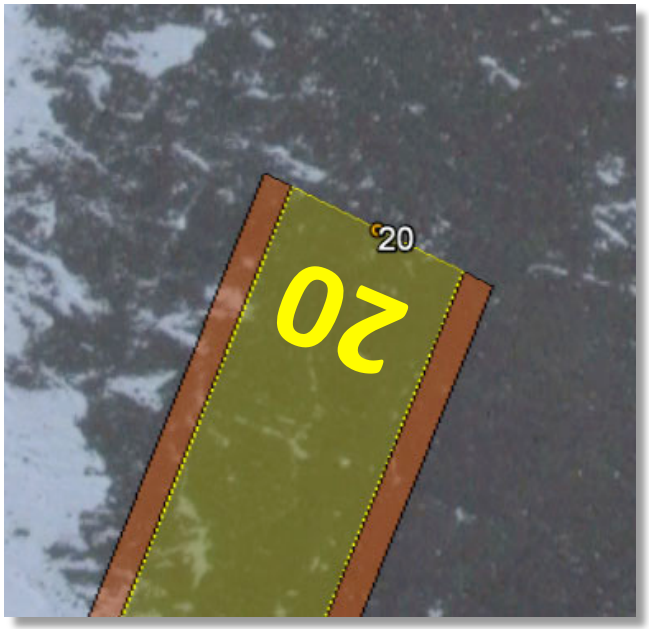
## TRANSVERSAL SECTION



# WHAT (IV)

**GRAVEL RUNWAY**

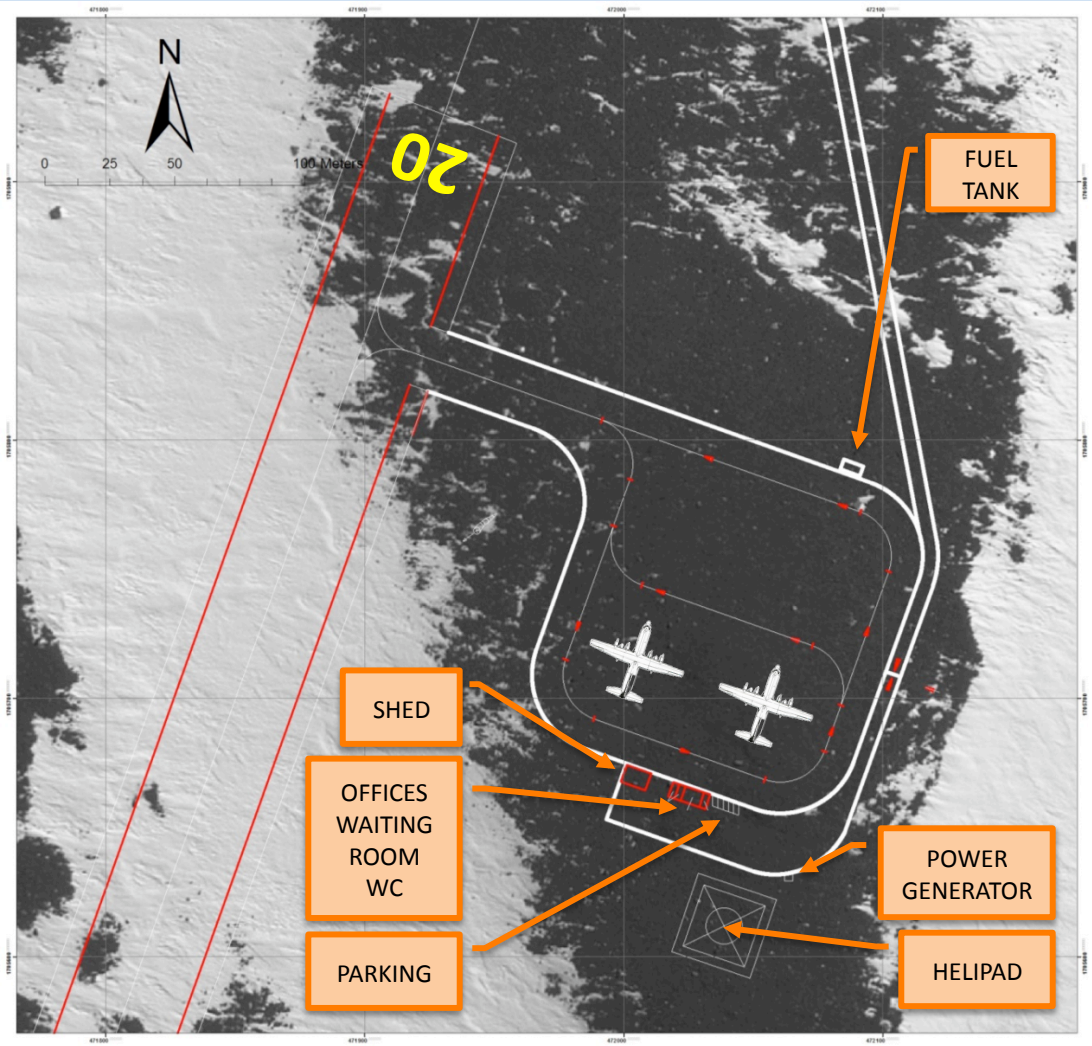
Length: **2.200 m**
Width: **60 m** (7,5m + 45m + 7,5m)
Direction: **NNE-SSW** (02/20)
Elevation: **200 m a.s.l.**
Aerodrome Reference Code: **4D**




# WHAT (V)

## FACILITIES

- ✓ **Apron** for 2 Hercules L100/30 aircracfts
- ✓ **Taxiways**
- ✓ **Parking area** for vehicles
- ✓ **Tank** for storing aviation fuel
- ✓ **Pipeline** for supplying aviation fuel
- ✓ **Office with a lounge** for arrival and departure passengers (removable buildings with their own renewable energy resources)
- ✓ Power generator
- ✓ Operation Room near AWS Rita site



# WHO

## ENEA - UTA (Antarctic Technical Unit)

***ENEA** entrusted studies to specialized engineering consultants:*

**SGI s.r.l.** (Studio Geotecnico Italiano) for geotechnical evaluation and project implementation

**ENAV S.p.A.** (Ente Nazionale Assistenza al Volo) for aeronautical design

**NHAZCA s.r.l.** (Sapienza University of Rome, spin-off) for the interferometric study on the moraine

**CNMCA of Italian Air Force** for the study of the wind field in the area (*presently in progress*)

# WHEN

CONSTRUCTION WILL START

After CEE (*Comprehensive Environmental Evaluation*) approval by the CEP (*Committee for Environmental Protection*)

CONSTRUCTION ACTIVITY WILL LAST

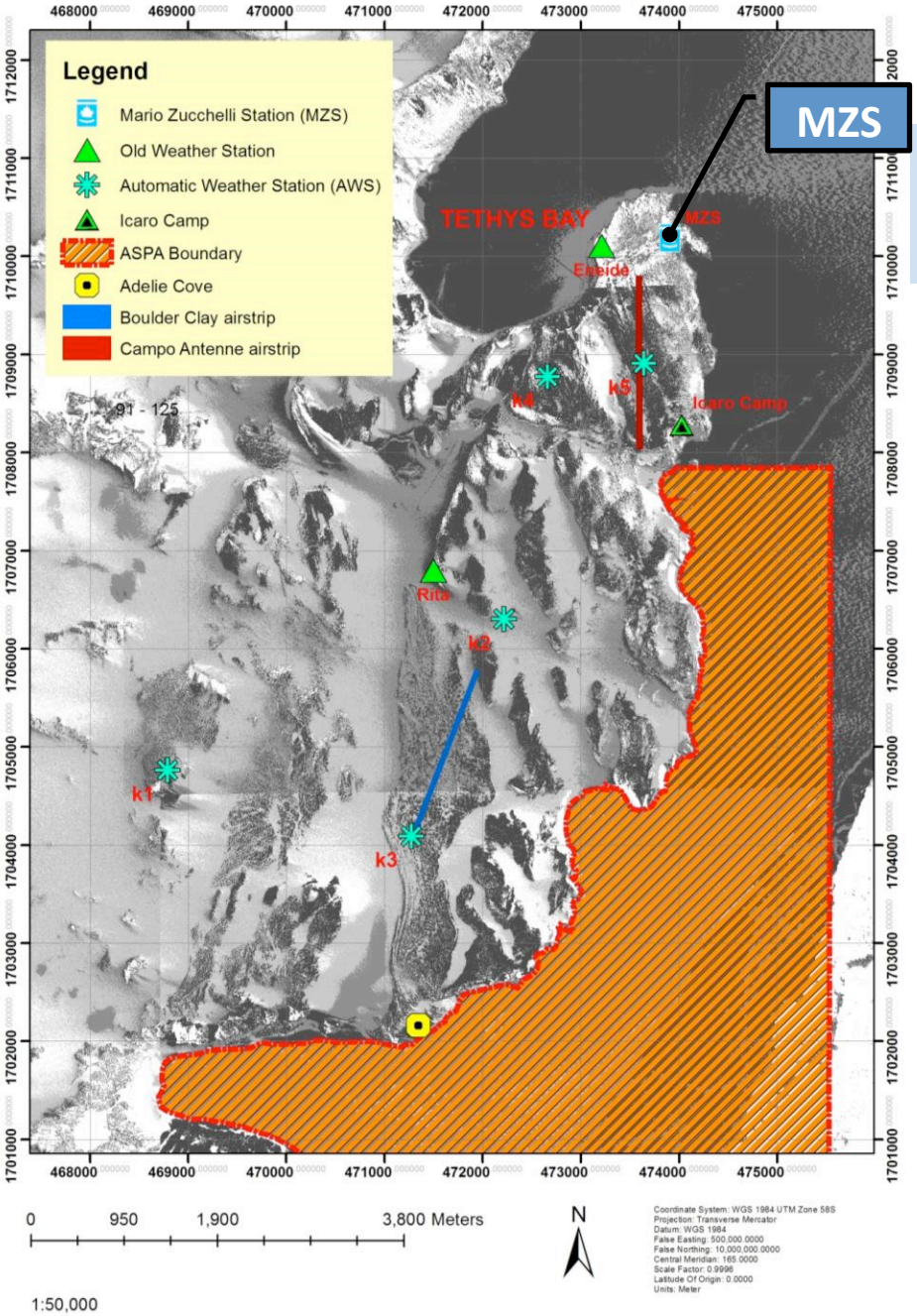
3 – 4 austral summers (3 months each)

RUNWAY WILL BEGIN TO OPERATE

likely in early 2020-21

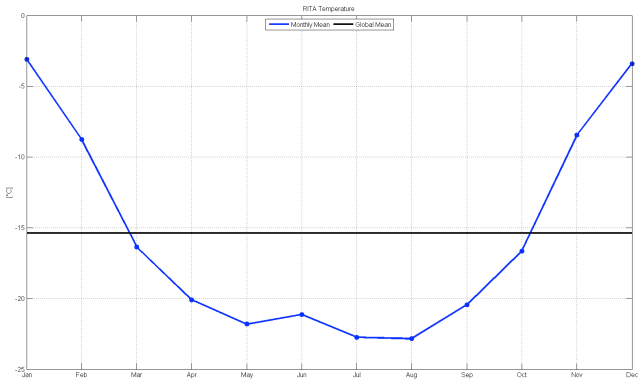
# METEOROLOGY OF THE AREA

| AWS | HEIGHT m | ALTITUDE m | SENSORS | INSTALLATION DATE |
|---|---|---|---|---|
| **ENEIDE** | 10 | 91,94 | P,T,RH,Ws,Wd Solar Radiation | Jan 1987 |
| **RITA** | 10 | 267,67 | P,T,RH,Ws,Wd | Jan 1993 |
| **K1** | 6 | 475,3 | P,T,RH,Ws,Wd | Feb 2013 |
| **K2** | 10 | 146,2 | P,T,RH,Ws,Wd plus Ultrasonic 3D at 10m | Feb 2013 |
| **K3** | 6 | 183,1 | P,T,RH,Ws,Wd | Feb 2013 |
| **K4** | 6 | 276,0 | P,T,RH,Ws,Wd | Feb 2013 |
| **K5** | 6 | 117,3 | P,T,RH,Ws,Wd | Feb 2013 |

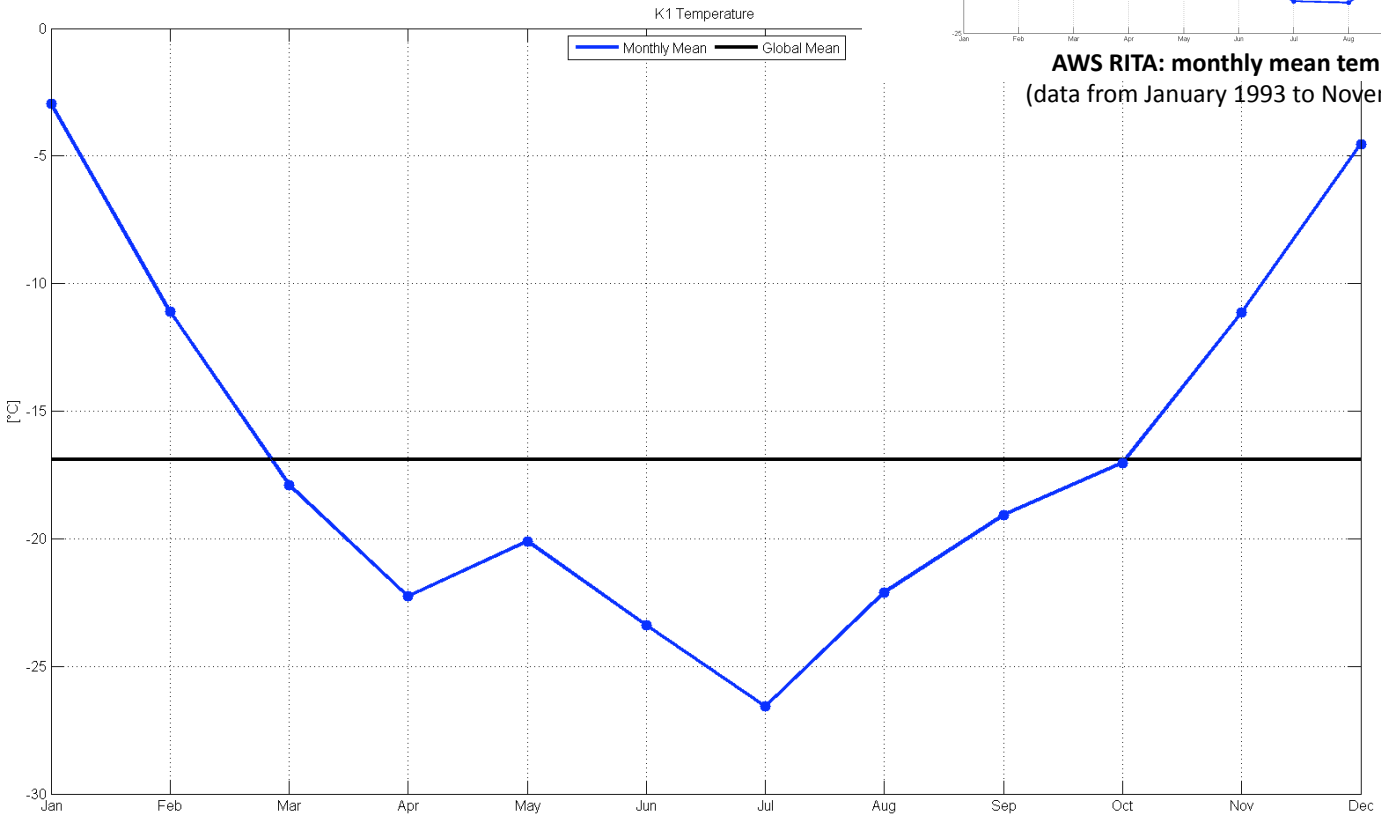


# METEOROLOGY OF THE AREA

T




**AWS RITA: monthly mean temperature**
(data from January 1993 to November 2011)

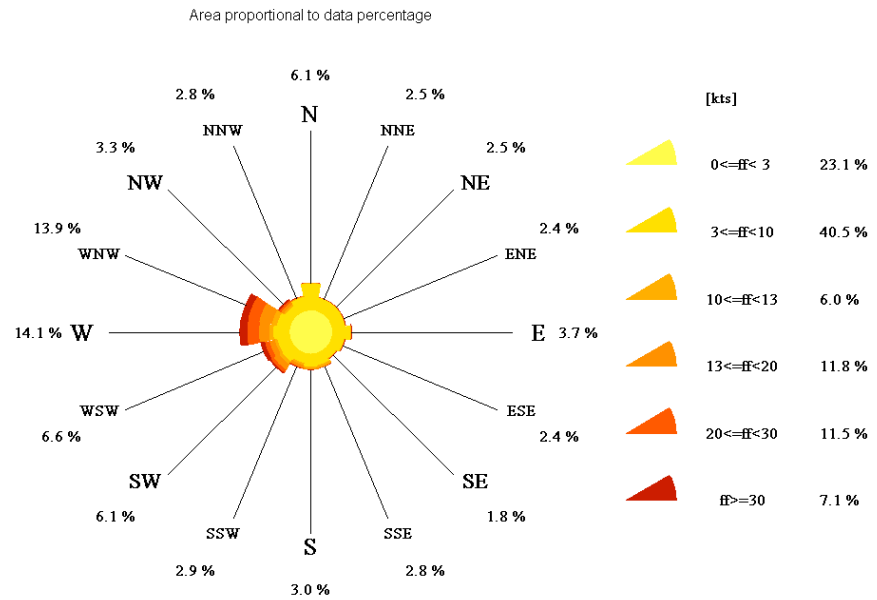



**AWS K1: monthly mean temperature**
(data from February 2013 to January 2015)

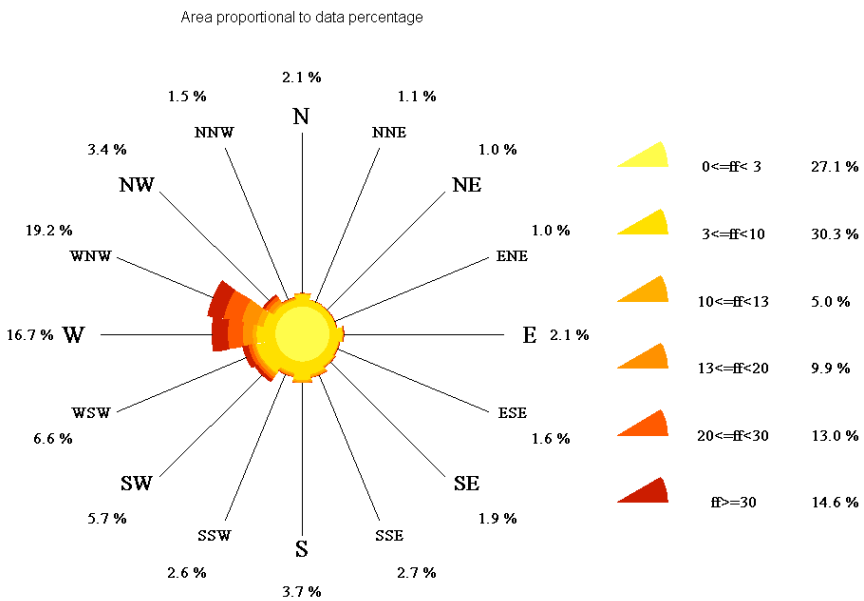
# METEOROLOGY OF THE AREA

## Ws, Wd

AWS eneide from October to February




AWS eneide from March to September

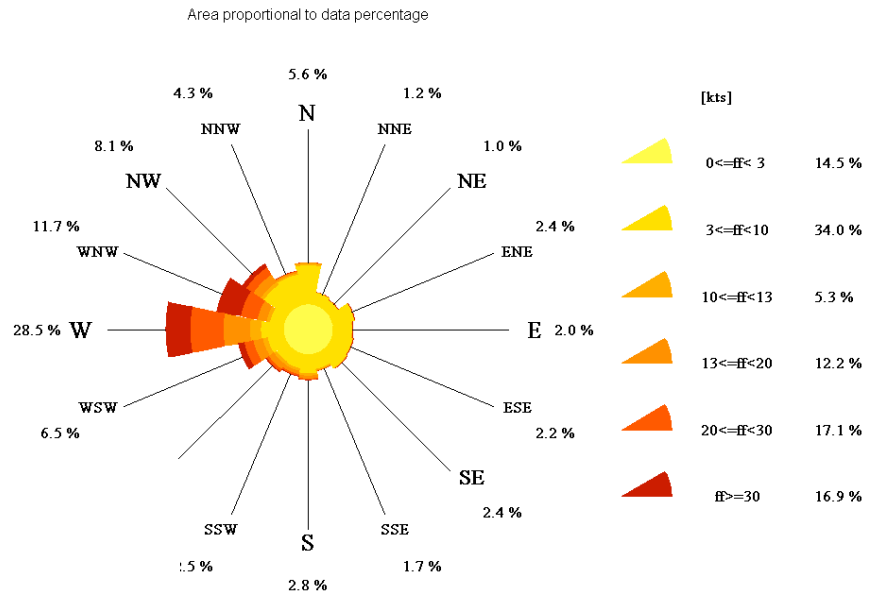



**AWS ENEIDE: wind speed and direction**
(hourly data from February 1987 to November 2011)

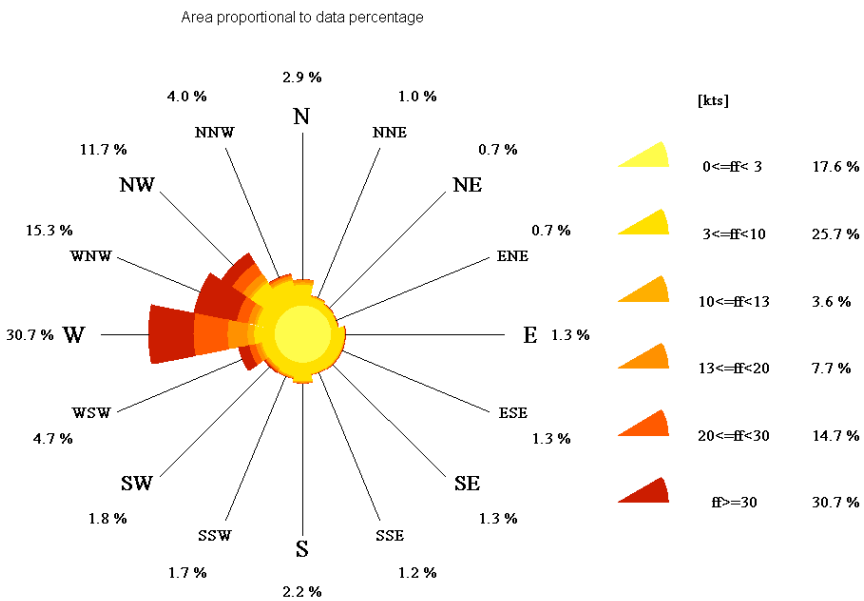
# METEOROLOGY OF THE AREA

## Ws, Wd

AWS rita from October to February



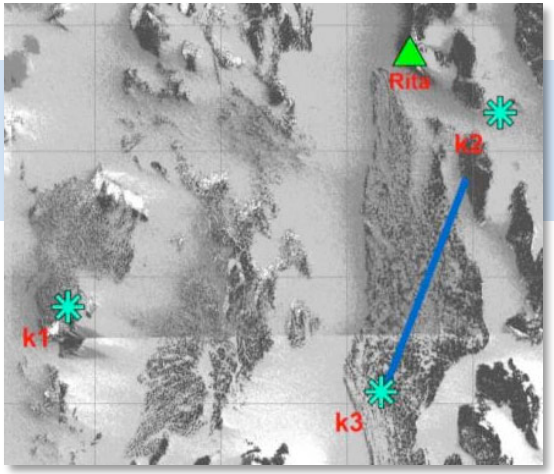

AWS rita from March to September




**AWS RITA: wind speed and direction**

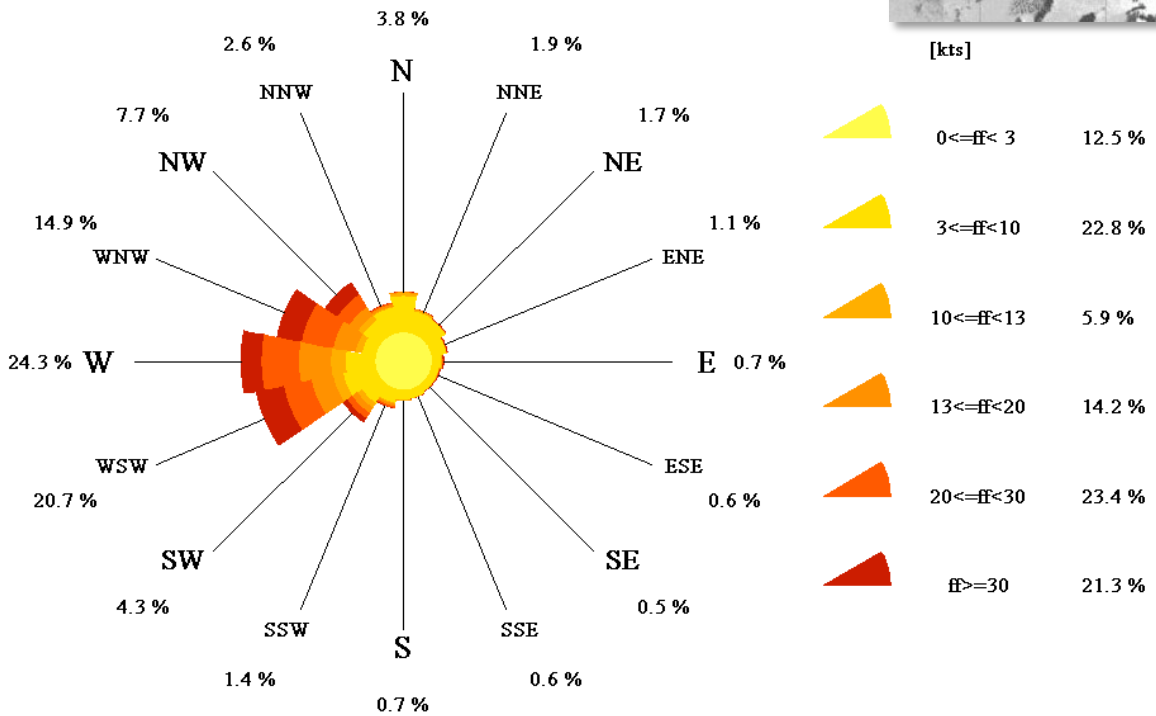
(hourly data from January 1993 to November 2011)

# METEOROLOGY OF THE AREA




## Ws, Wd

K1

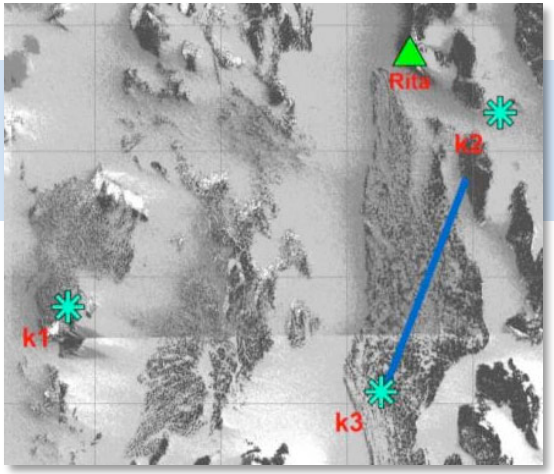



**AWS K1: wind speed and direction, Summer period (October - February)**
(hourly data from February 2013 to January 2015)

# METEOROLOGY OF THE AREA

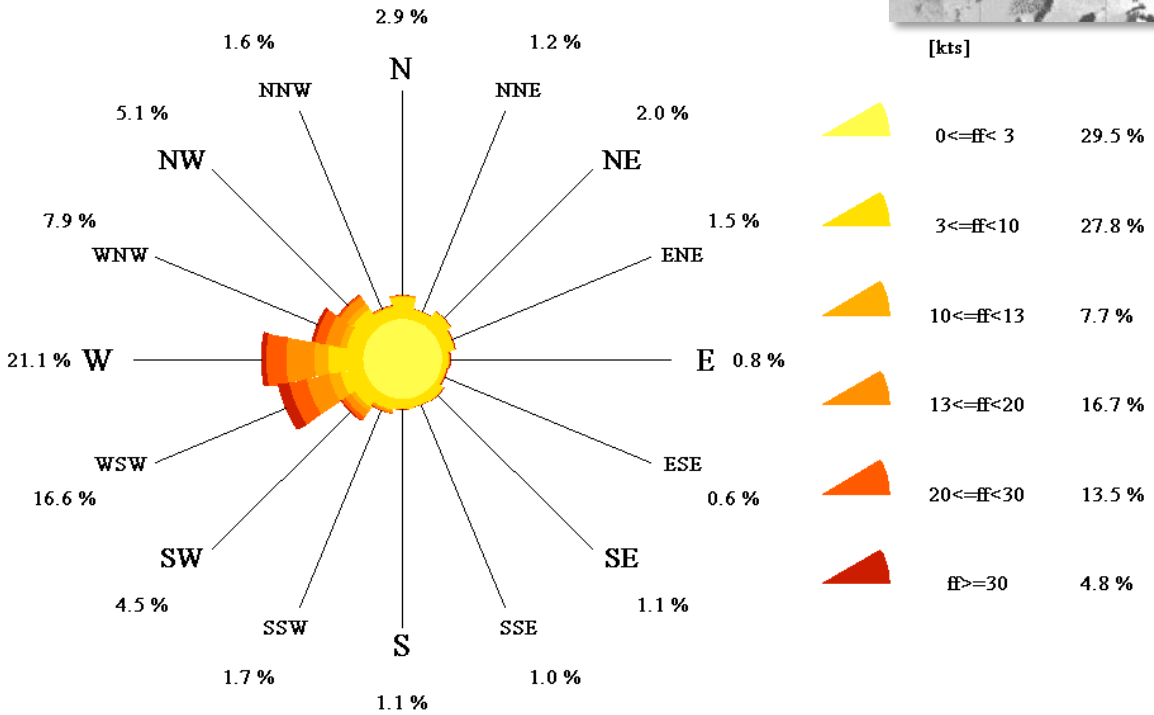
## Ws, Wd

K2




AWS K2 Summer hourly data

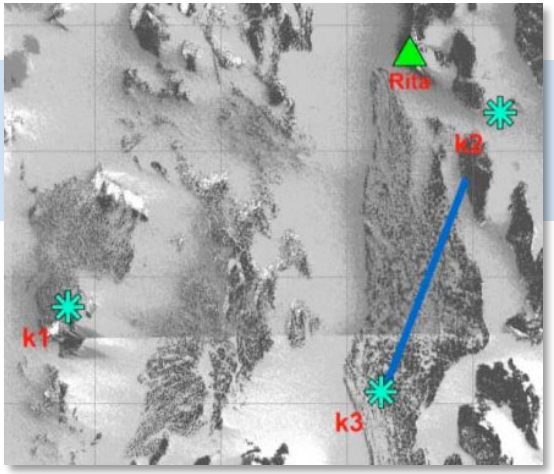
Area proportional to data percentage




**AWS K2: wind speed and direction, Summer period (October - February)**

(hourly data from February 2013 to January 2015)

# METEOROLOGY OF THE AREA

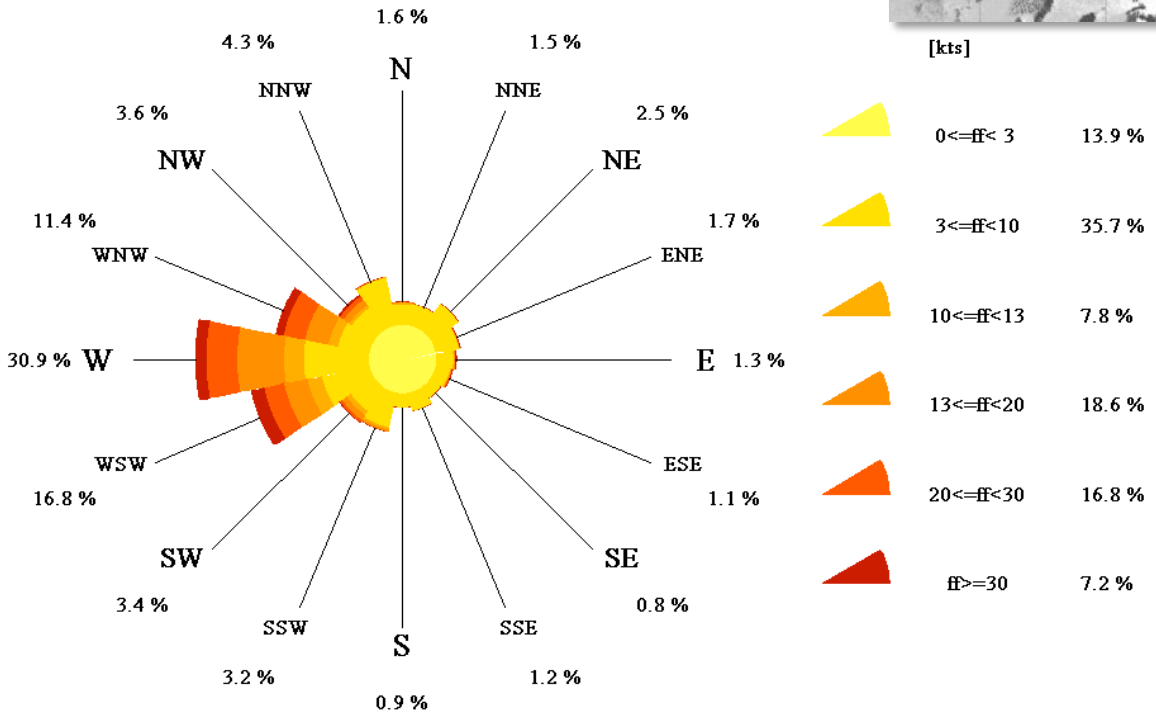



## Ws, Wd

AWS K3 Summer hourly data

Area proportional to data percentage

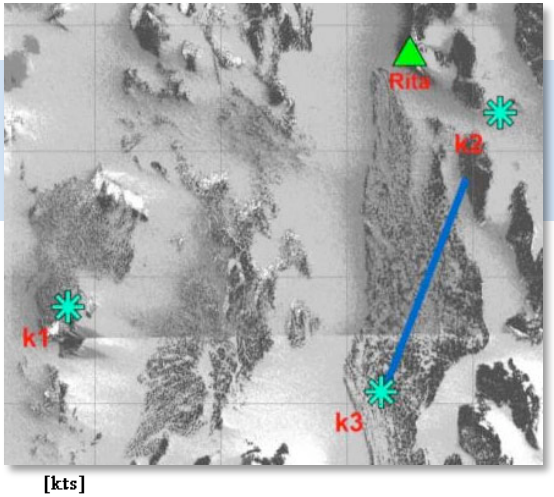
K3




**AWS K3: wind speed and direction, Summer period (October - February)**

(hourly data from February 2013 to January 2015)

# METEOROLOGY OF THE AREA

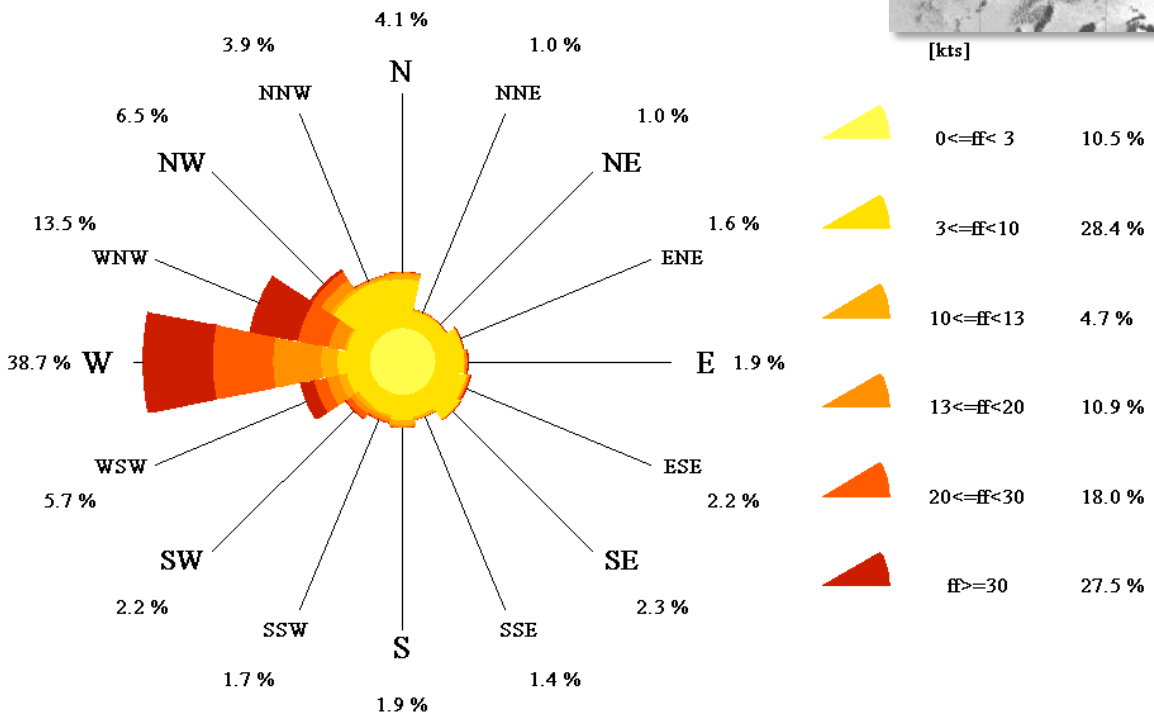



AWS Rita Summer hourly data

Area proportional to data percentage

## Ws, Wd

**Rita**

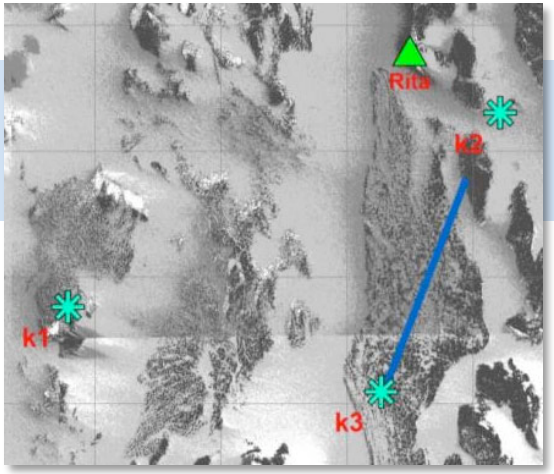



**AWS RITA: wind speed and direction, Summer period**

(hourly data from February 2013 to October 2014)

# METEOROLOGY OF THE AREA

## Ws, Wd




| | October | November | December | January | February | Summer (Oct – Feb) | Winter (Mar – Sep) |
|---|---|---|---|---|---|---|---|
| K1 | 11.6 | 16.0 | 26.7 | 29.5 | 21.0 | 20.7 | 9.6 |
| K2 | 11.4 | 11.7 | 18.2 | 24.5 | 18.5 | 16.6 | 10.4 |
| K3 | 6.3 | 15.4 | 18.5 | 20.6 | 17.1 | 16.8 | 10.0 |
| RITA | 3.7 | 5.7 | 7.3 | 7.0 | 4.5 | 5.7 | 4.3 |

**Comparison of percentage distribution of WSW wind**

(K1, K2 and K3: hourly data from February 2013 to January 2015, Rita: hourly data from February 2013 to October 2014)

# METEOROLOGY OF THE AREA

## Wind Shear

| Interim criteria for wind shear intensity<br>recommended by the Fifth Air Navigation Conference (Montreal, 1967)<br>source: ICAO - Manual on Low-level Wind Shear (Doc 9817), 2005 (AMD 2 Feb. 2011) | |
|---|---|
| LIGHT | 0 to 4 kt inclusive per 30 m (100 ft) |
| MODERATE | 5 to 8 kt inclusive per 30 m (100 ft) |
| STRONG | 9 to 12 kt inclusive per 30 m (100 ft) |
| SEVERE | above 12 kt per 30 m (100 ft) |

**"a change in wind speed and/or direction in space, including updrafts and downdrafts"**

*Wind shear, being the change of wind vector from one point in space to another, is given by the vector difference between the winds at two points, which itself is a vector (having both speed and direction). The intensity of the shear is calculated by dividing the magnitude of the vector difference between the two points by the distance between them, using consistent units* (ICAO, 2005).

*Commonly expressed in: m/s per 30 m or knots per 100 ft*

# METEOROLOGY OF THE AREA

| Interim criteria for wind shear intensity<br>recommended by the Fifth Air Navigation Conference (Montreal, 1967)<br>source: ICAO - Manual on Low-level Wind Shear (Doc 9817), 2005 (AMD 2 Feb. 2011) | |
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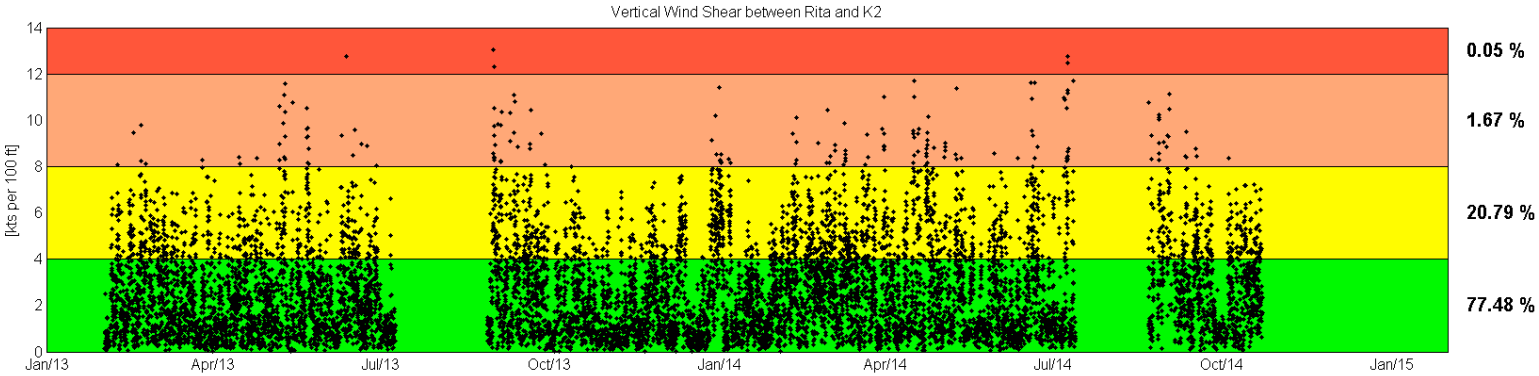


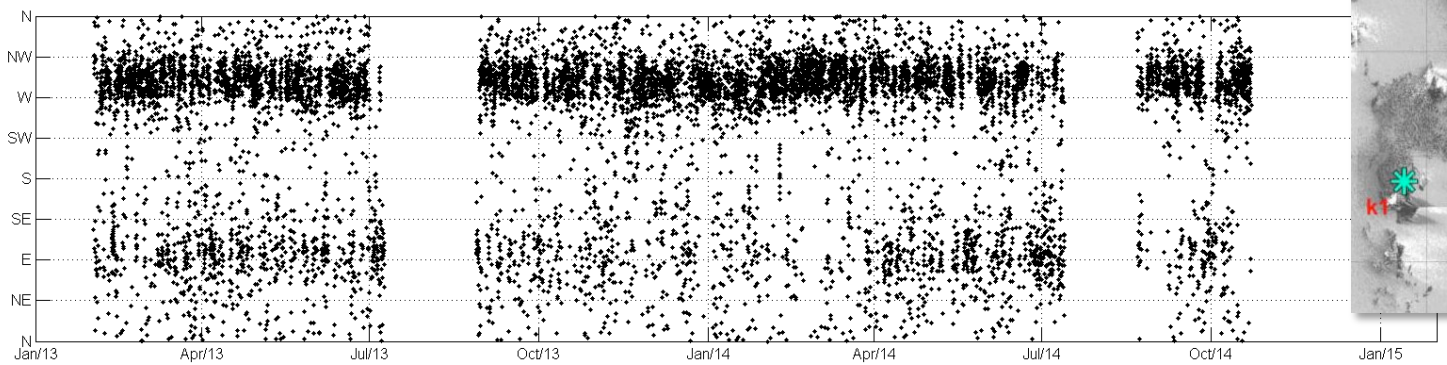


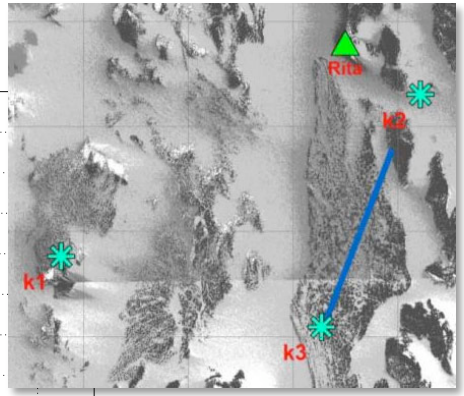


**Intensity and direction distribution of <u>vertical</u> wind shear between <u>Rita and K2</u>**
(hourly data from February 2013 to October 2014)

# METEOROLOGY OF THE AREA

| Interim criteria for wind shear intensity<br>recommended by the Fifth Air Navigation Conference (Montreal, 1967)<br>source: ICAO - Manual on Low-level Wind Shear (Doc 9817), 2005 (AMD 2 Feb. 2011) | |
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| LIGHT | 0 to 4 kt inclusive per 30 m (100 ft) |
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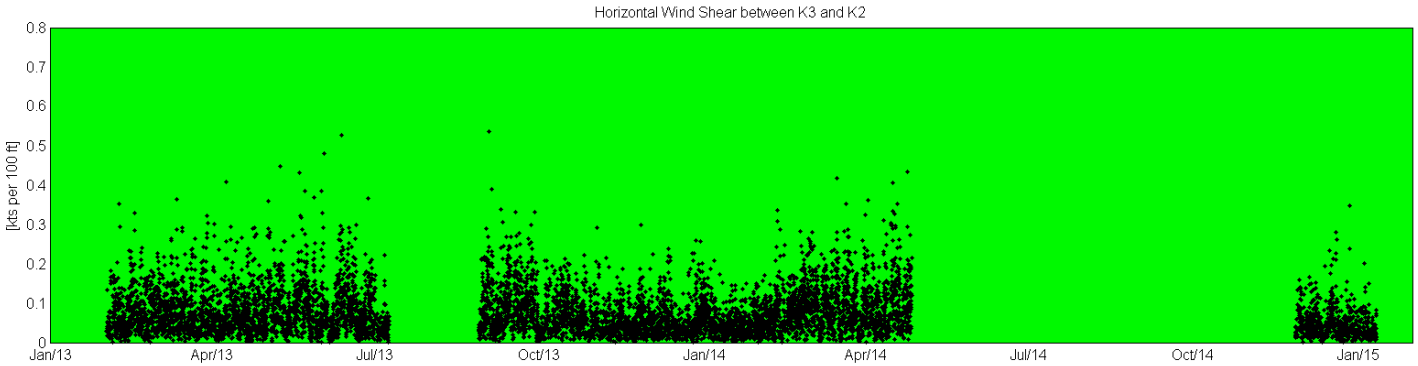
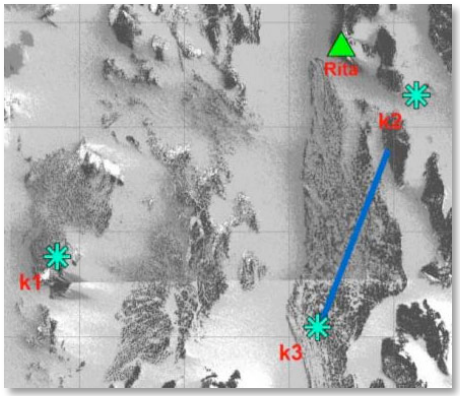
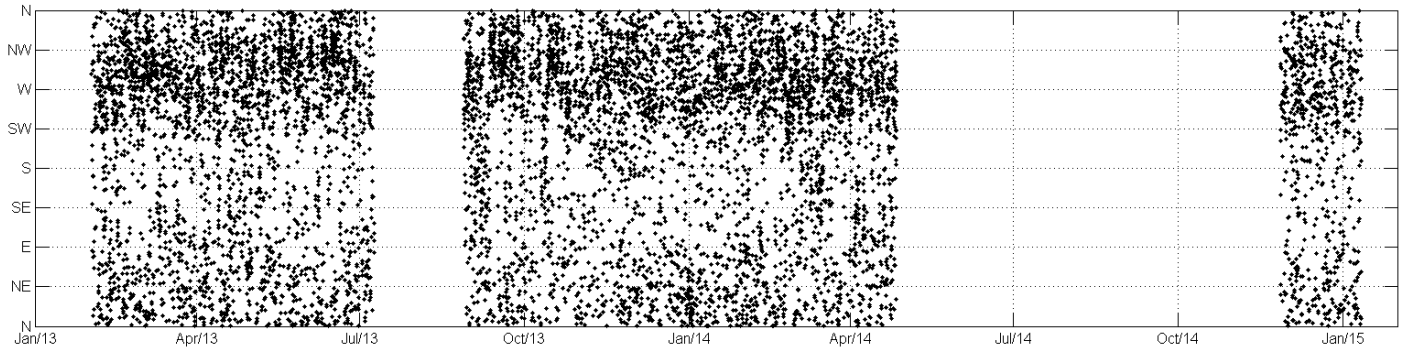



100 %




**Intensity and direction distribution of <u>horizontal</u> wind shear between <u>K2 and K3</u>**
(hourly data from February 2013 to October 2014)

# THANKS FOR YOUR ATTENTION…