DEFENCE R&D DÉFENSE

Climatology for Radar and EO Sensor Performance Studies

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Climatology for Radar and EO Sensor Performance Studies

Outline

- Purpose
- Developmental Approach
- Products
- Future Work

Requirements

Selection of meteorological conditions for sensor performance studies in given regions

Usual considerations:

- Yearly/monthly statistics of single dependant parameter
- Considering more parameters knowing the cross-correlation between parameters
- Set of full condition descriptions

Requirement:

A means to select representative meteorological conditions

Approach

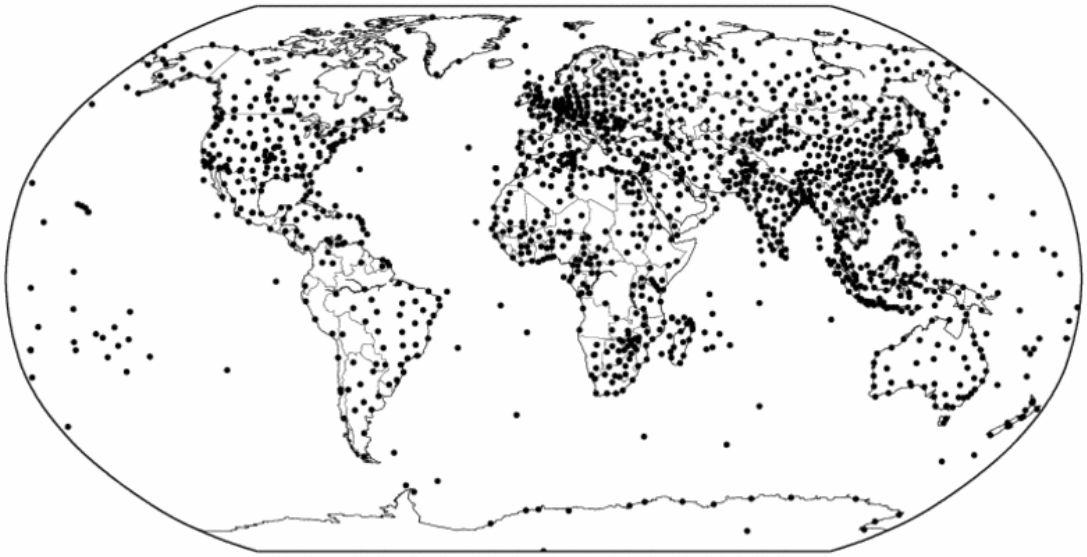
For a given location on Earth and a given season:

1. Identification of the dominant air masses (or clusters) ⇨ ***scenarios***
2. Characterization of the scenarios (statistics of parameters of interests)
3. Extraction of ***representative profiles***

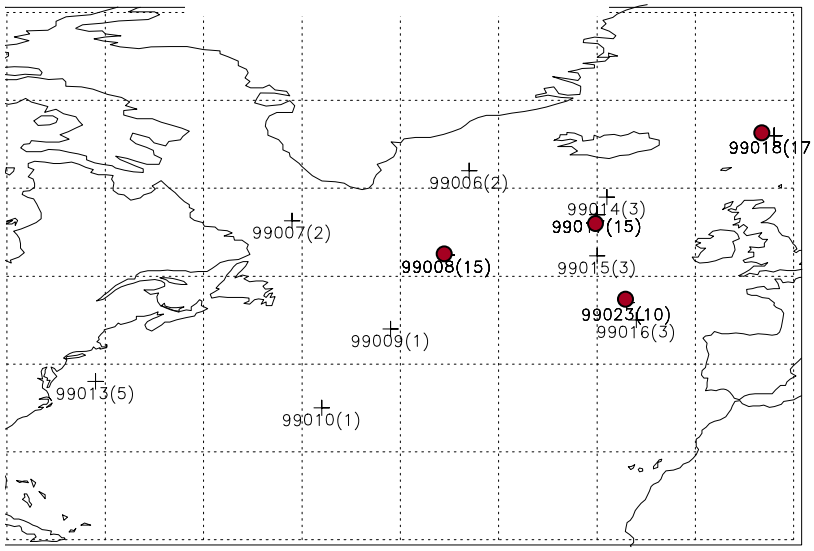
Sources of data

- **National Climatic Data Center (NCDC)**
  - Integrated Global Radiosonde Archive **(IGRA)**
  - Ocean Weather Ship data **(OWS)**
  - Integrated Surface Hourly obs **(ISH)**
- **ICOADS + NOAA SST Analysis**

IGRA stations



OWS locations



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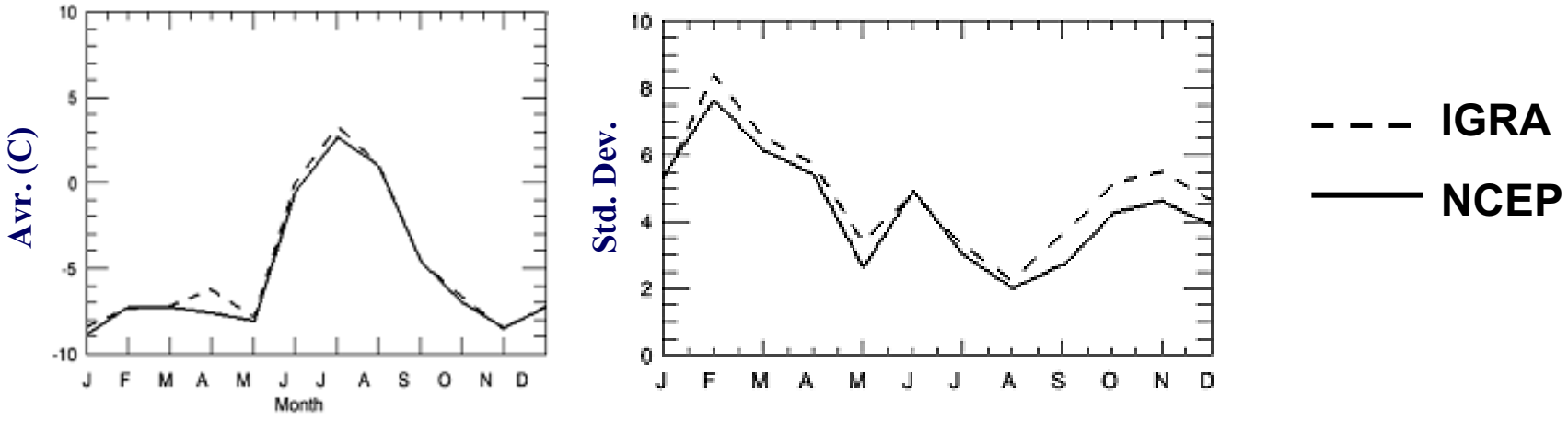
- **ICOADS + NOAA SST Analysis**
- **NCEP-NCAR Re-analysis data**
- **Int. Satellite Cloud-Climatology Project (ISCCP)**

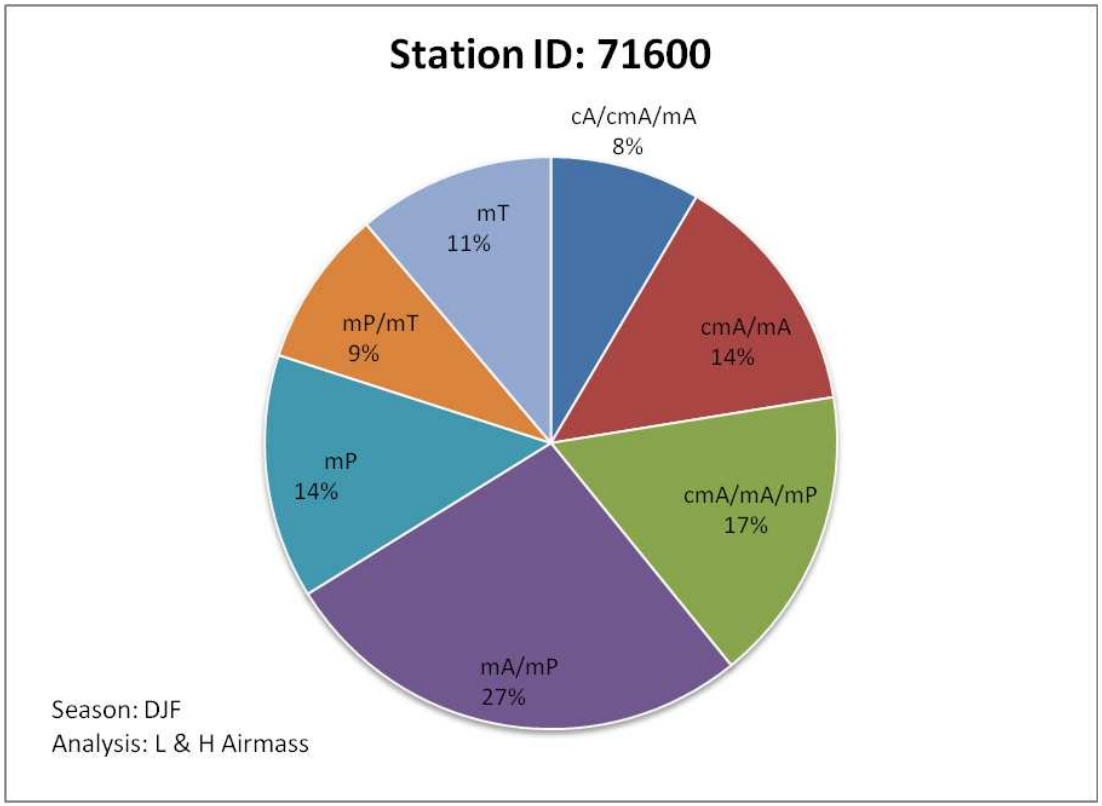
Jan Meyen 850 mb Temperature



Identification of air masses

- Definition of seasons: DJF, MAM, JJA, SON
- Analysis of θ_e at three pressure levels: 850, 700 and 500 mb
- Rules for air mass definition (θ_e ranges, thresholds)

		θ_e min	θ_e max
800 mb	cA		270.0
	cmA	272	276
	mA	278	288
	mP	290	301
	mT	303.0	
750 mb	cA		272.0
	cmA	274	281
	mA	283	290
	mP	292	303
	mT	305.0	
500 mb	cA		285.0
	mA	287	295
	mP	297	306
	mT	308	



Cluster Analysis

Necessary for regions where standard air mass theory does not apply:

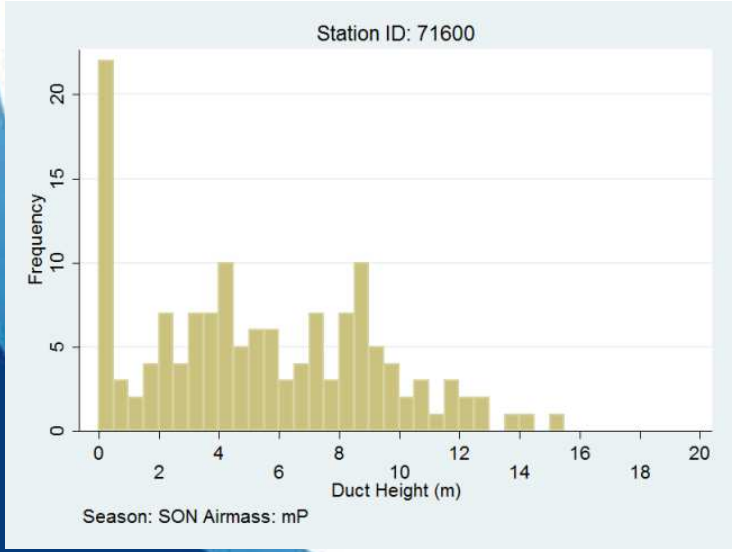
subtropics, tropics, polar regions …

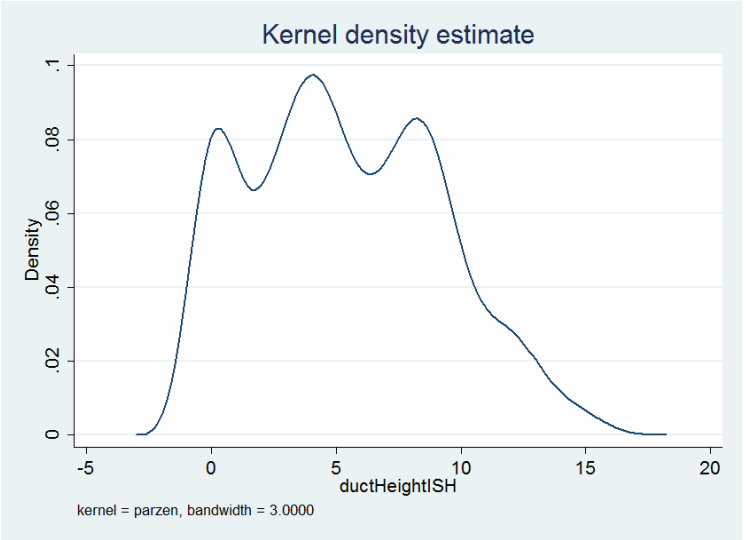
Main issues:

- Determine the input parameters: *PW, TmTd700, Z_LCL*, θ_{e0}, *K*, *KOI, …*
- Determine the right number of clusters
- Define seasons

Climatology Outputs

- **Merged Data Set for selected stations:**
  - Raw data from the pertinent data sources: IGRA, ISH, …
  - Air mass / cluster analysis
- **Representative profiles based on:**
  - θ_e average at mandatory levels
  - Average & modes of duct height, visibility, ASTD and wind speed



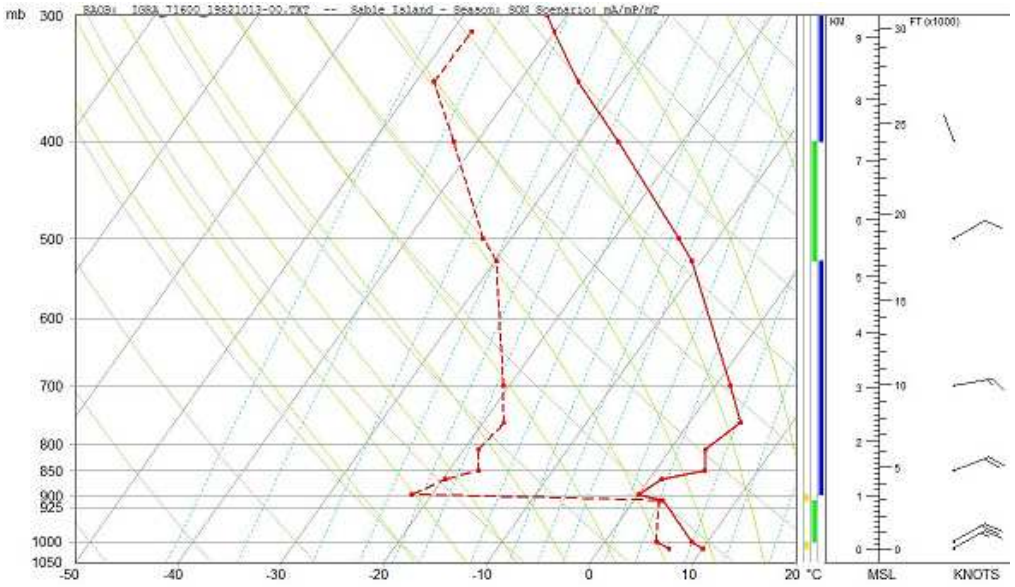


Representative profiles

```
##VERSION     : 1.0.0
##STATION NAME: Sable Island
##STATION ID  : 71600
##REGION      : North Atlantic
##SEASON      : SON
##SCENARIO    : mA/mP/mT
##DATE        : 1982/10/13/00
##
##Air Temperature ( C)        :   10.0
##Relative Humidity (%)       :   78.3
##Wind Speed (m/s)            :   11.8
##Wind direction ( )          :     50
##Wind speed 24 h (m/s)       :   13.0
##MSL Pressure (hPa)          : 1015.2
##Visibility (km)             : 10 - 20km
##Precipitation Type          : None
##Precipitation Intensity     : None
##Sea Surface Temperature ( C):   11.6
##H1/3 wave height (m)        :    2.0
##Duct Height (m)             :    8.0
##
##Met measurement height (m)  :   12.0
##Sfc measurement height (m)  :    0.0
##Pressure sensor height (m)  :   12.0
##Wind sensor height (m)      :   19.5
##
##CLOUD DATA SECTION
##Total Cloud Amount (/8ths): 8
##Low Cloud Amount (/8ths)  : 8
##Low Cloud Type            : stratocumulus
##Low Cloud Base Ht.        : 300 to  600m
##Mid Cloud Type            : No obs
##High Cloud Type           : No obs
#
##Cloud Thickness (km)      :  0.70
##Cloud Top Height (km)     :  0.90
##Inversion Height (km)     :  1.10
#
# HEIGHT  PRESSURE  TEMPERATURE  REL HUM.  WIND SPEED WIND DIR RADAR REFRACT
#  [m]     [mb]       [ C]        [%]       [m/s]      [ ]     [M-unit]
#-------------------------------------------------------------------------
   0.00   1016.00      9.85       79.91      15.60      49      443.57
   0.05   1009.98      9.25       79.61      17.78      49      435.73
   0.10   1003.97      8.65       79.31      19.96      49      428.13
   0.15    998.07      8.13       79.51      21.35      50      422.32
   0.20    992.39      7.78       80.65      21.19      50      419.62
   0.25    986.71      7.42       81.79      21.03      50      416.92
   0.30    981.04      7.07       82.93      20.88      51      414.23
   0.35    975.36      6.72       84.07      20.72      51      411.56
   0.40    969.68      6.36       85.21      20.57      51      408.89
   0.45    964.00      6.01       86.35      20.41      52      406.23
   0.50    958.33      5.66       87.49      20.26      52      403.58
   0.55    952.65      5.30       88.63      20.11      52      400.94
   0.60    946.97      4.95       89.77      19.96      53      398.32
   0.65    941.29      4.60       90.91      19.81      53      395.70
   0.70    935.62      4.24       92.05      19.66      53      393.08
   0.75    929.94      3.89       93.19      19.51      54      390.48
   0.80    924.26      3.54       94.33      19.36      54      387.89
   0.85    918.58      3.18       95.47      19.21      54      385.31
   0.90    912.91      2.83       96.61      19.06      55      382.73
   0.95    907.23      2.00       78.73      18.92      55      339.20
```

- Skew-T/Log-p graphic
- Raw upper-air profile (IGRA) file
- Composite meteorological description, containing cloud analysis

  Txt and TEMP format



Future Work

- Review of the format and user interface
- Characterization of land regions
- Revisit season definition
- Synoptic description by regions