UCLM
CAMPUS DE EXCELENCIA INTERNACIONAL

# REAL-TIME SPATIOTEMPORAL DATA ACQUISITION SYSTEMS: AGROCLIMATIC STATIONS AS MAINSTREAM TECHNOLOGIES TO ESTIMATE CROP WATER REQUIREMENTS

## REQUIRED COMPONENTS: FROM THE BASIC REQUIREMENTS TO THE BEST OPTION

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ITALIAN AGENCY FOR DEVELOPMENT COOPERATION

# PREVIOUS CONCEPTS

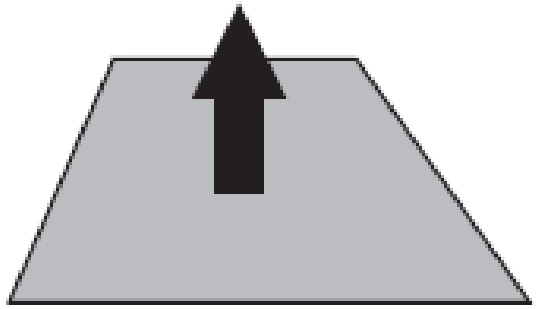
Agriculture consumes more than the 80% of fresh water in arid and semiarid regions

40% of food is produced by 16% of agricultural lands which correspond to irrigated areas

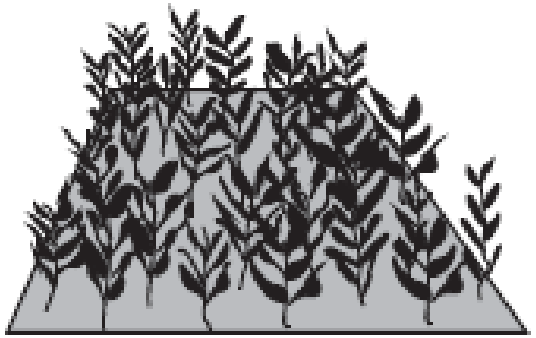
# PREVIOUS CONCEPTS

**Water requirements = Crop development x Weather**

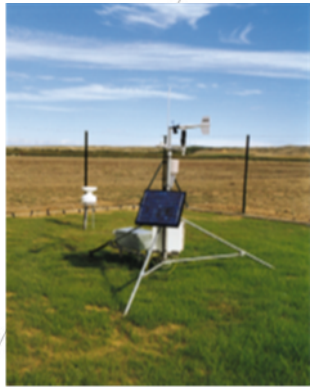
$ET_C$



$K_c$ factor



$ET_O$



# PREVIOUS CONCEPTS

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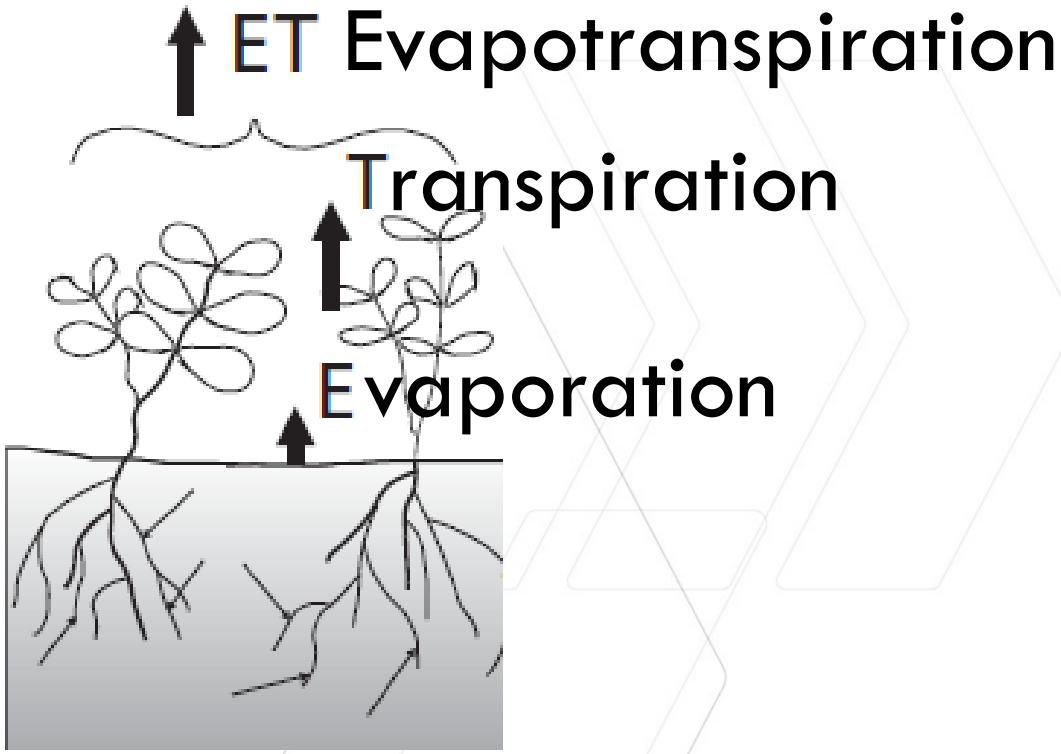


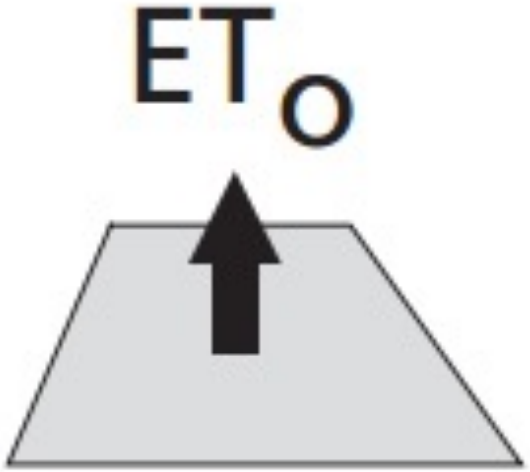
# PREVIOUS CONCEPTS

Radiation
Temperature
Wind
Humidity

Grass reference crop

+

=

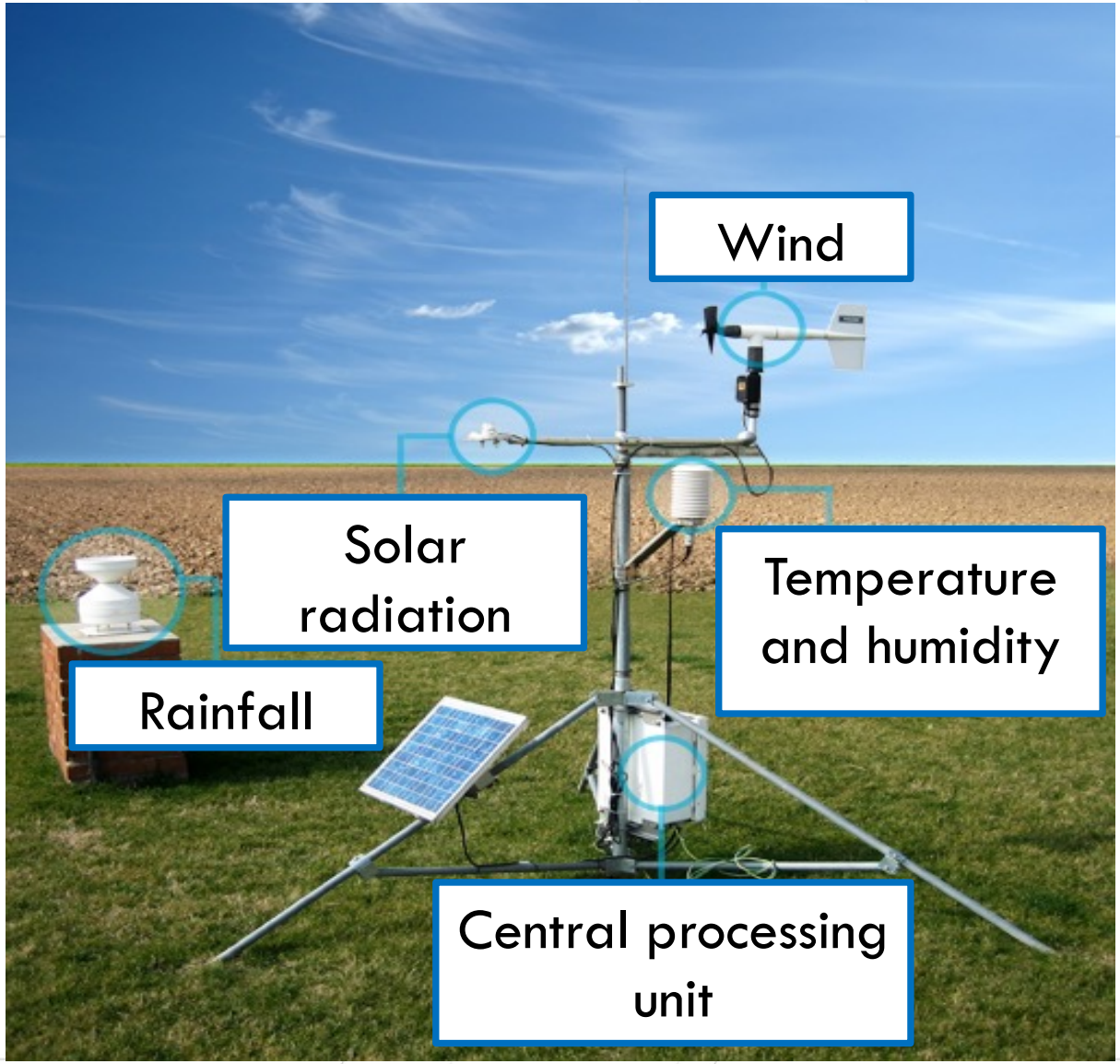


# PREVIOUS CONCEPTS

$ET_O$

**Weather**

**Reference evapotranspiration**
**(mm=l/m²)**


Wind
Solar radiation
Temperature and humidity
Rainfall
Central processing unit

# PREVIOUS CONCEPTS

- **Weather stations**

Stations installed along countries to monitor meteorological variables and provide weather warnings

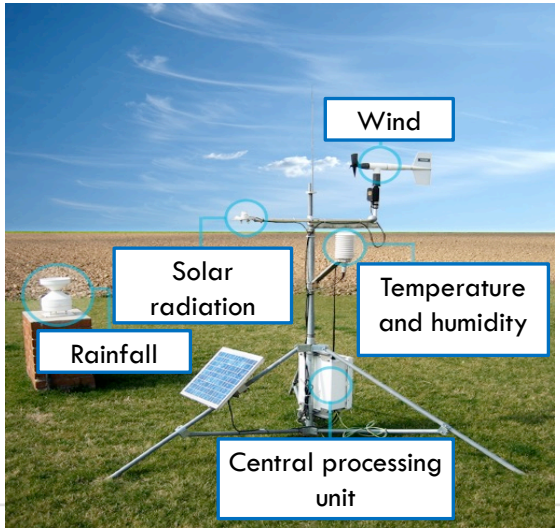
- **Agroclimatic stations**

Stations installed in irrigation areas which generates valuable information for agricultural sector: from the calculation of crop irrigation needs to the choice of the appropriate moment to applicate phytosanitary products

# PREVIOUS CONCEPTS

- **Complete stations**

All required variables for crop water needs calculation are registered



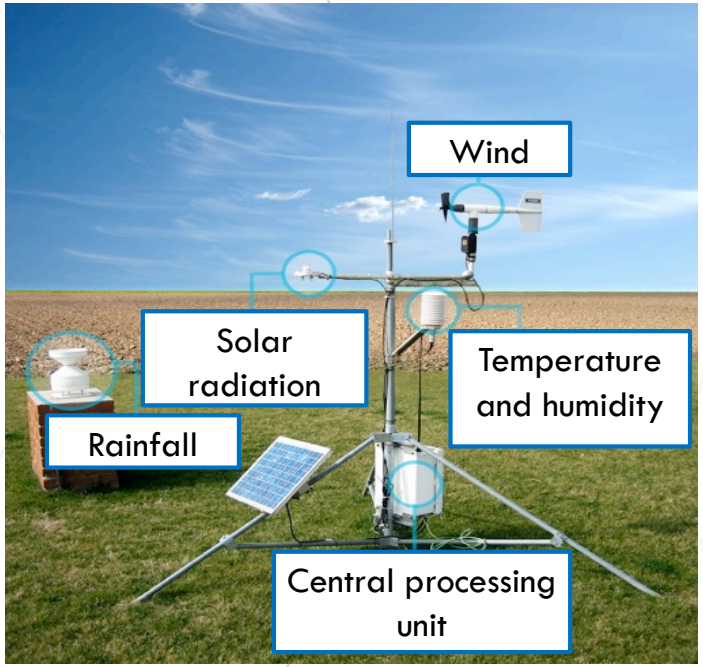

- **Non complete stations**

Only some climatic variables are registered

# SENSORS

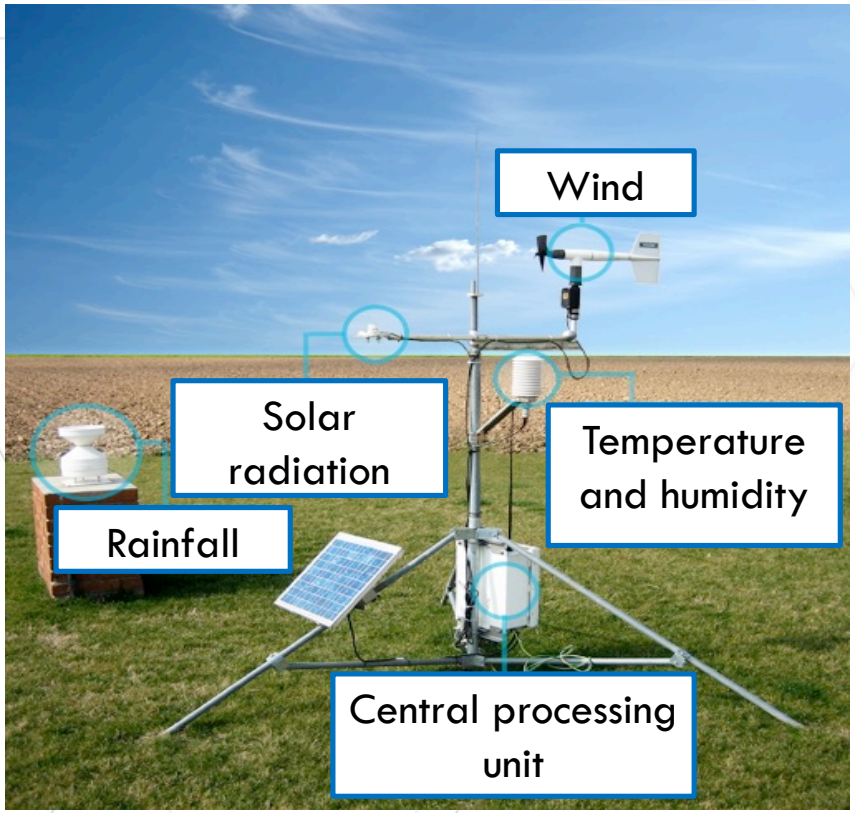
## Automatic vs. manual agroclimatic stations

- Increase the number and reliability of surface observations.
- Increasing the reliability of measurements by using sophisticated technology and modern, digital measurement techniques
- Reducing human errors
- Lowering operational costs



# SENSORS

- Temperature and humidity

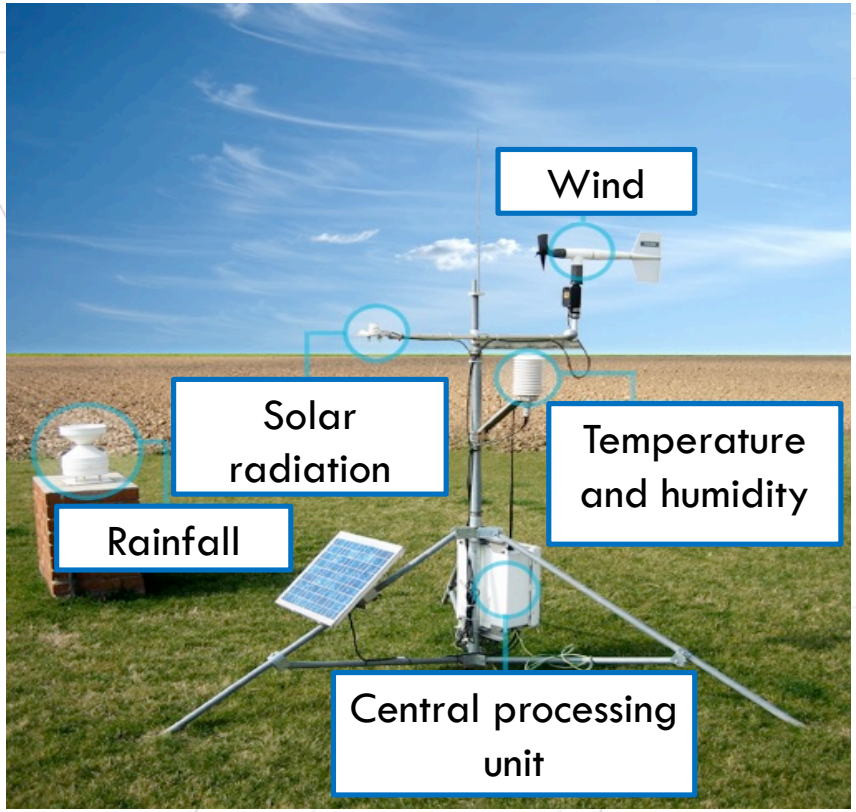


## • Prove Vaisala HMP45C

| Weather variable | Range | Sensor | Units |
|---|---|---|---|
| Temperature | -39,2 °C to +60 °C | ± 0,2 °C | °C |
| Relative humidity | 0,8 to 100 % | ± 2 % | % |

# SENSORS

- Wind

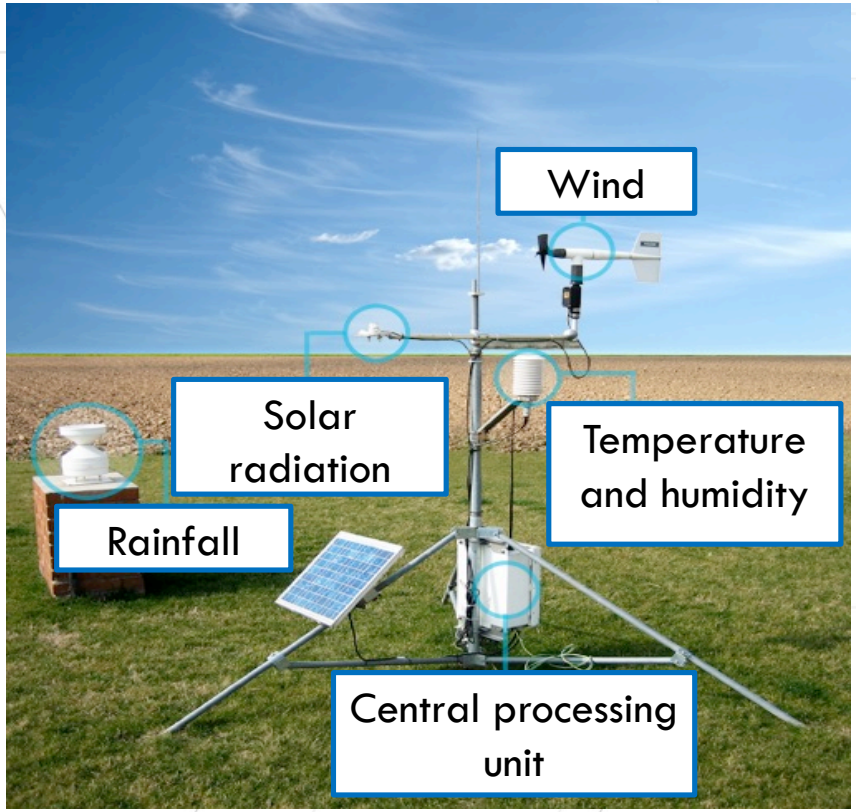


## • Anemometer RM Young 05103

| Weather variable | Range | Sensor | Units |
|---|---|---|---|
| Speed | ±0,3 m/s to 1-60 m/s<br>±1,0 m/s to 60-100 m/s | 1-100 m/s | m/s |
| Direction | ±3° | 0-360° | ° |

# SENSORS

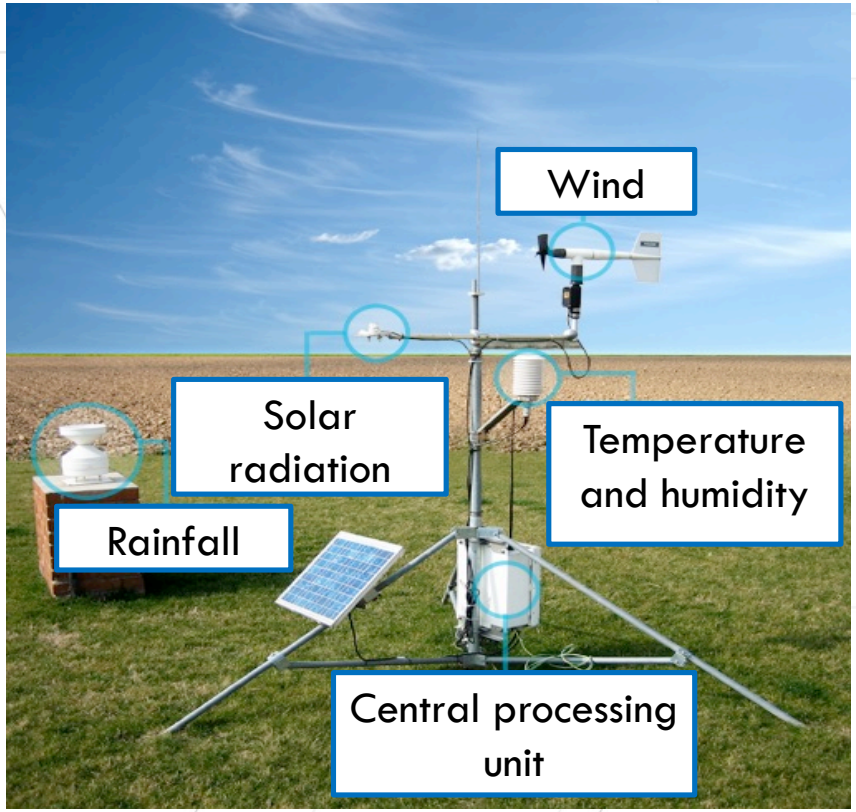
- Pluviometer



- Pluviometer

# SENSORS

- Solar radiation



- Pyranometer SKYE SP1110

| Weather variable | Range | Units |
|---|---|---|
| Solar radiation | 350-1100 nm | nm |

# RECORDS

| Weather variable | Records | Storage | Transmission |
|---|---|---|---|
| Temperature | 2 minutes | 30 minutes | 24 hours |
| Humidity | 2 minutes | 30 minutes | 24 hours |
| Wind speed and direction | 5 seconds | 30 minutes | 24 hours |
| Solar radiation | 5 seconds | 30 minutes | 24 hours |
| Rainfall | 5 seconds | 30 minutes | 24 hours |