VAISALA

Cornerstones of successful upper air observations

How soundings form the backbone of weather observation systems

The value of meteorology

Meteorology exists to help save lives and property in the face of hazardous weather conditions. Extreme weather such as floods, hurricanes, and blizzards has a profound impact on society—disrupting economies around the world and costing countries billions in annual repairs. With less infrastructure in place, the developing world has even more at stake.[a]

Agriculture, energy, transportation, construction, tourism and healthcare are the top industries at risk for asset loss and that benefit the most from advance warnings from weather forecasts.

Weather forecasting provides early warnings so people can prepare in advance to save lives and property.

Weather forecasting in European Union (EU27) annually saves:

- 200-800 lives
- 0.5-2.7 B€ in assets

In the developing world, the projected annual savings are:

- 23,000 lives
- 0.3-1.9B€ in assets

In the United States, a 1% improvement in hydroelectric power generation due to better weather forecasting would save $81 M annually[b]

Cost to benefit ratio of improving weather forecasts in developing world is up to 1:36[c]

[a]EU27 Impact Report
[b]US National Weather Service, 2002
[c]World Bank Policy Research Working Paper 6058, "A Cost Effective Solution to Reduce Disaster Losses in Developing Countries", Stéphane Hallegatte, May 2012

VAISALA

6 steps to weather preparation

1 Observation systems provide data

2 Network management tools manage hardware

3 Observation leads to weather forecasts

4 Forecasts lead to weather warnings

5 Operators interpret the warnings

6 Decision-makers recommend actions

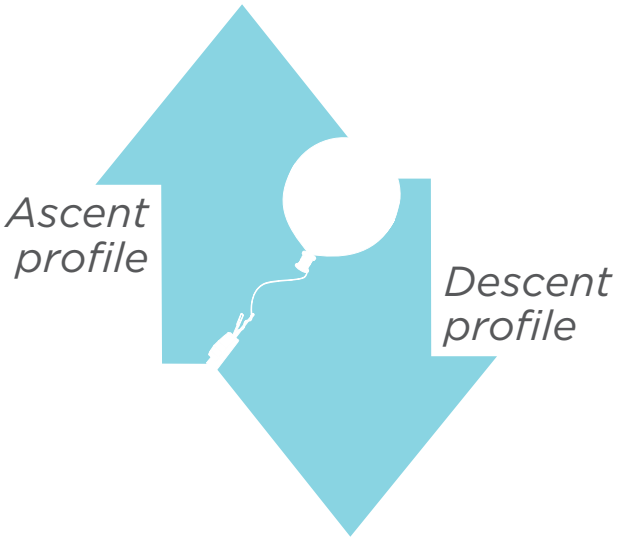
VAISALA

The role of soundings in numerical weather prediction

An atmospheric sounding is a vertical profile of the atmosphere indicating atmospheric conditions. Soundings help complete the weather picture provided by observation systems.

The two most important surface based observation systems contributing to global numerical weather prediction (NWP) models are: radiosondes and aircraft data.[d]

NWP models can use the 4D location data from radiosondes through high-resolution BUFR message formats. Converted TEMP messages, on the other hand, do not include position data and do not add value.



Soundings provide long-term forecasting capabilities through 4D data acquired on their ascent. In addition, they provide additional information on the descent that gives meteorologists more data on the atmospheric conditions.

[d]Sixth WMO Workshop on the Impact of Various Observing Systems on Numerical Weather Prediction, Shanghai, China, 10-13 May 2016, Workshop Report

VAISALA

The cornerstones of successful upper air observations:

High-quality data and automatic soundings

The role of high-quality sounding data in forecasting

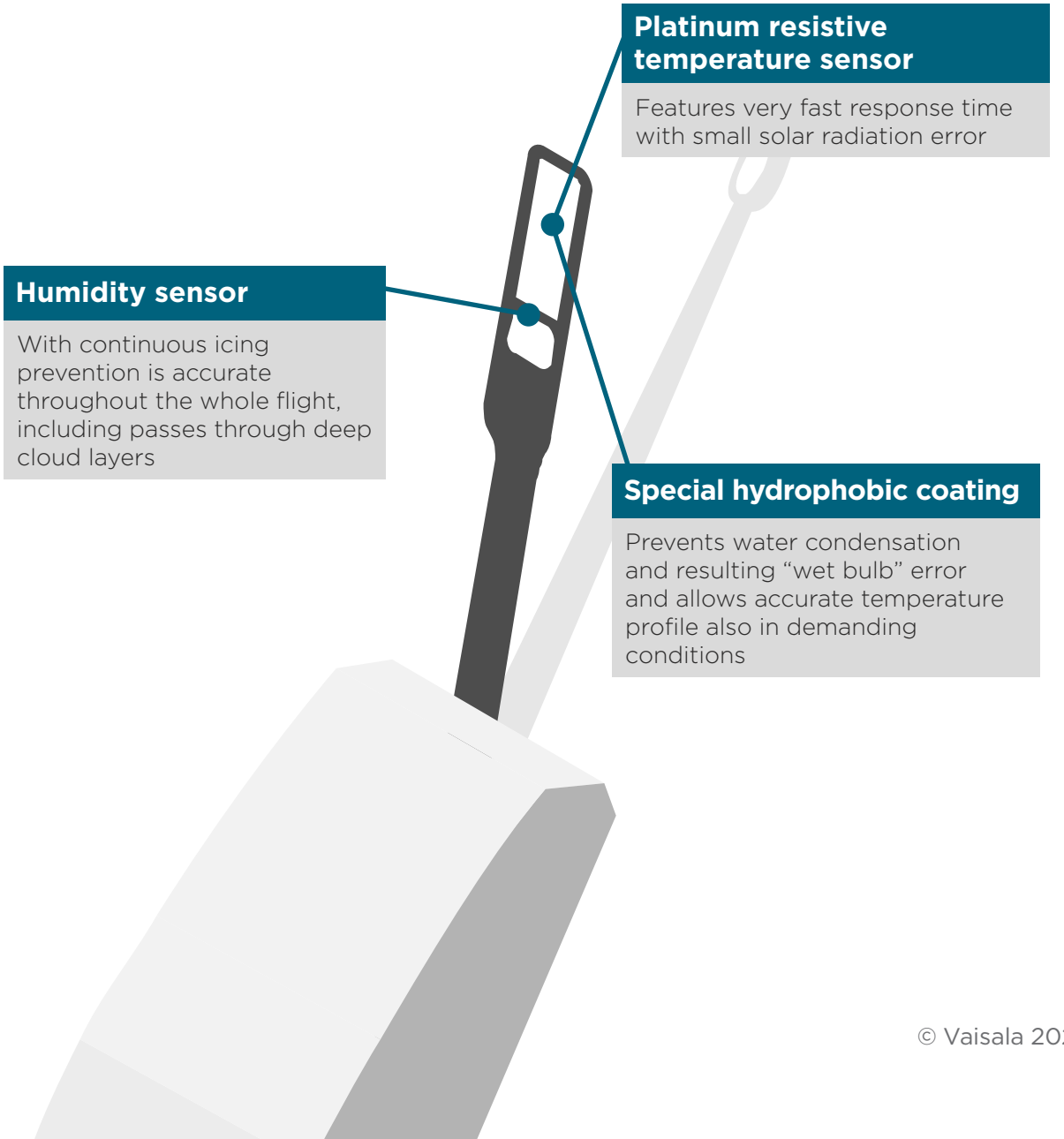
Convective weather forecasts rely on the vertical profile features of an air mass. The likelihood of thunderstorms is measured by convective available potential energy (indicating thunder) and convective inhibition (indicating the likelihood of a storm not to occur).

Sounding features that help forecasting:

- Cloud layers: solar heating
- Temperature inversions: inhibition
- Humidity, especially in the lowest kilometer and above the cloud top

Conversely, poor quality sounding data can adversely affect forecasting. For example:

- If the temperature sensor gets covered by water when it goes through the cloud, it can miss an inversion altogether.
- If the humidity sensor freezes as it rises, it could miss the cloud top, and not provide information on the higher cloud layers including the amount of solar heating.



VAISALA

Why automatic soundings?

An automatic sounding system makes the sounding process efficient and reliable.

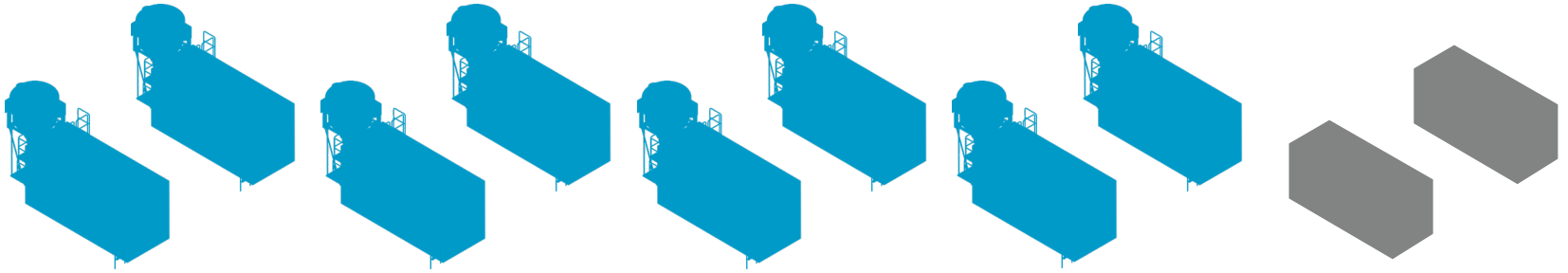
Benefits of Vaisala Autosondes:

- Superior data quality and availability
- Less weather sensitive – ideal for harsh environments
- No onsite staffing required – staff can focus on forecasting
- Lower labor and facility costs over equipment life

There are over 100 Vaisala Autosondes operating around the world in the toughest environments from freezing, wind-whipped Antarctica to the harsh deserts of Australia.

Vaisala introduced Autosondes in 1994, and our Autosondes continue to lead the market because their high quality-data and dependable service.

8 of every 10 automatic sounding systems in the world are from Vaisala



VAISALA

Vaisala AUTOSONDE® AS41 and Vaisala Radiosonde RS41:

An accurate and reliable sounding solution

AUTOSONDE® AS41

- Offers the longest autonomous sounding capacity on the market
- Operates in harsh climates
- Easy to install and safe to use – even with hydrogen
- Low maintenance with easy remote control

Radiosonde RS41

- Platinum resistive temperature sensor for durable, fast data capture with minimal solar radiation error
- Special hydrophobic coating provides accurate temperature profiles in demanding conditions while preventing condensation and the resulting wet bulb
- Humidity sensor features continuous icing prevention to prevent ice buildup – even through deep cloud layers
- Provides reliable and accurate humidity data, even from the upper troposhere.

Learn more about the Radiosonde RS41 and AUTOSONDE® AS41.

vaisala.com/soundings

VAISALA