



SDB

Looking for S-44 compliance



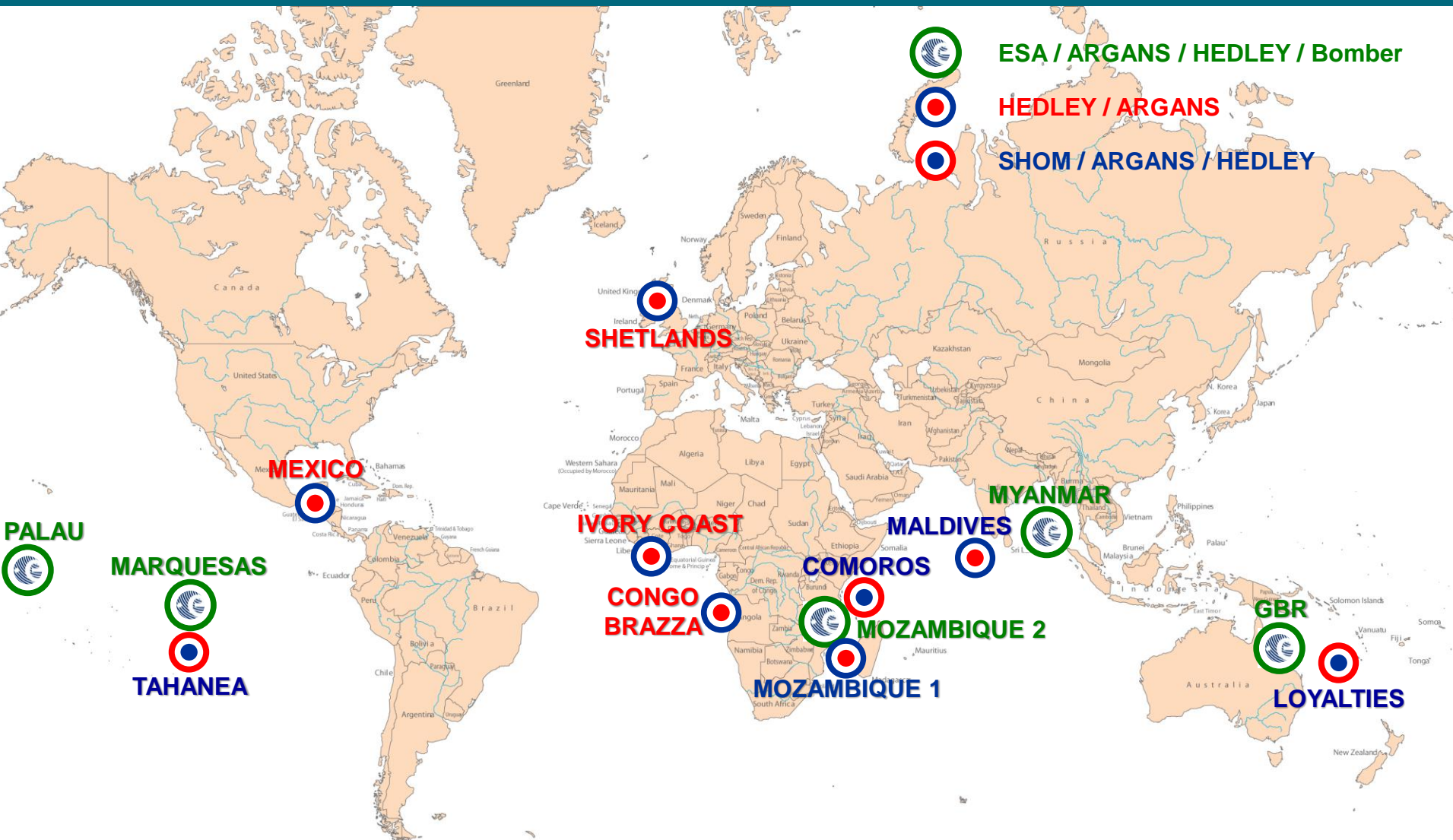
Foreword

ARGANS Ltd. www.argans.co.uk, is a British SME, specialised in Earth Observation (EO). Its main client is the European Space Agency (ESA) for whom, together with its parent company, the French Group ACRI www.acri.fr, has been developed among other tasks a number of applications for **sensors calibration & intercalibration** and **data validation algorithms**.

ARGANS currently runs an inversion software developed in cooperation with Dr John Hedley, a world specialist in the physics of transmission of light from Top (TOA) to Bottom of the Atmosphere (BOA) and marine habitats.

By associating Physicists and Hydrographers, ARGANS aims at completing the physics-based model with a conclusive hydrographic application to nautical charting. Its goal is to achieve compliance with the S-44.

SDB test sites



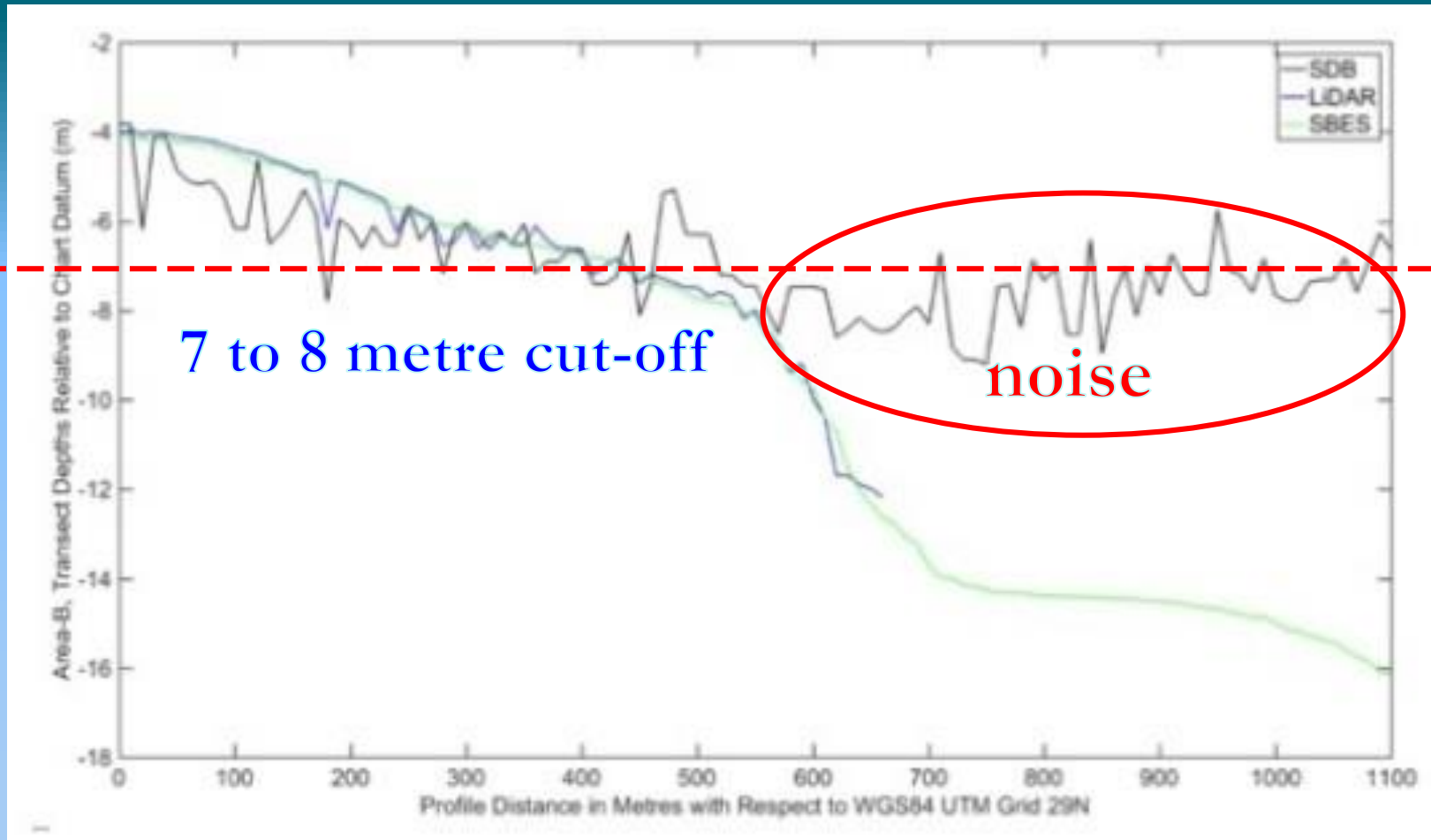
A valid assessment of today's' SDB potential by an independent outsider

In the “Soundings” 2017 last issue, William Dann, BSc, Plymouth University, draws the following conclusions from his SDB/Lidar/SBES survey of the Scilly Isles:

With limited information on UKHO methods for producing SDB, this study still produced data almost meeting uncertainty requirements of the IHO CATZOC 'C' standard. However, lack of information presents difficulties in determining just how closely. Unlike the UKHO using SDB for charting, the data produced by this study was unsuitable for that purpose. However, it could be used for reconnaissance and assessing areas inaccessible by air or sea [8]. For commercial use of SDB within charting operations, accuracy and uncertainties need to be greatly improved. With more time, this could be achieved by substrate classification of the survey area and *in situ* measurement of water column properties, thus allowing the development of multiple algorithms for different types of substrate.

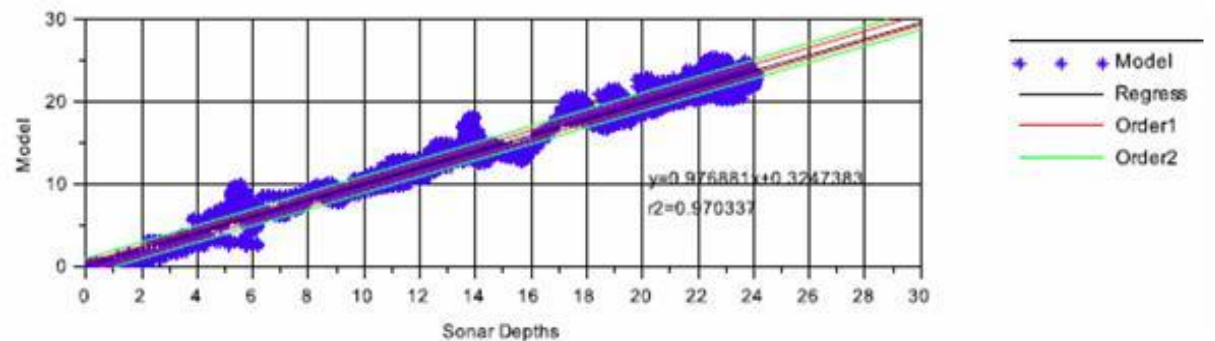
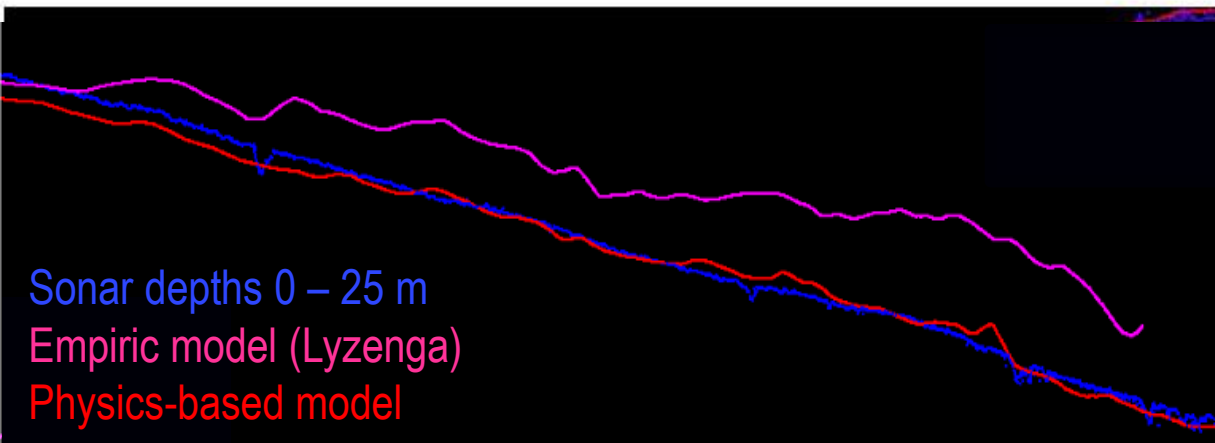
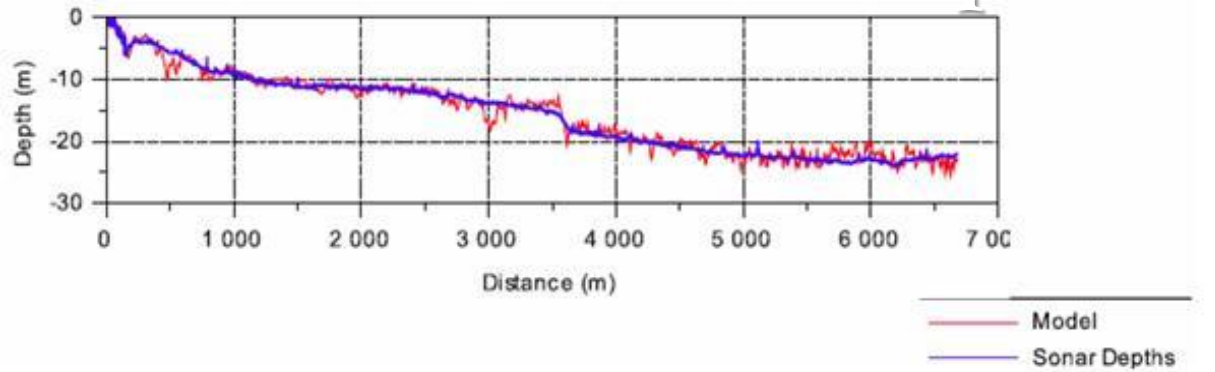


A typical SDB transect



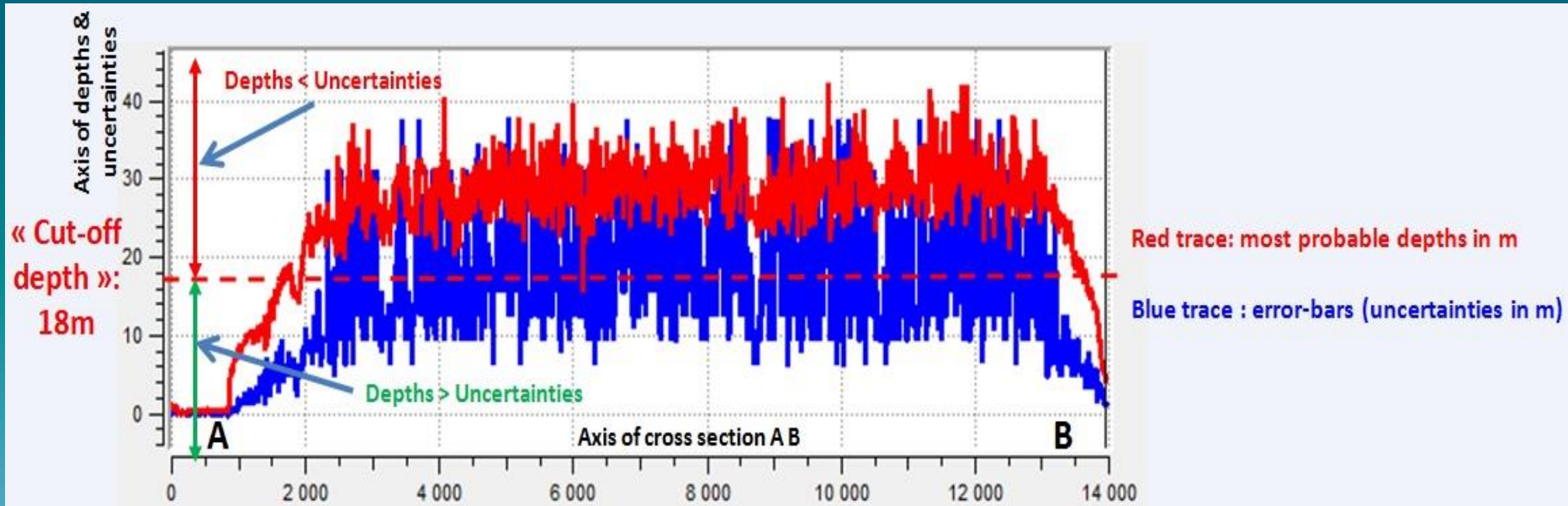
Source: "Soundings" W. Dann

ARGANS best performances



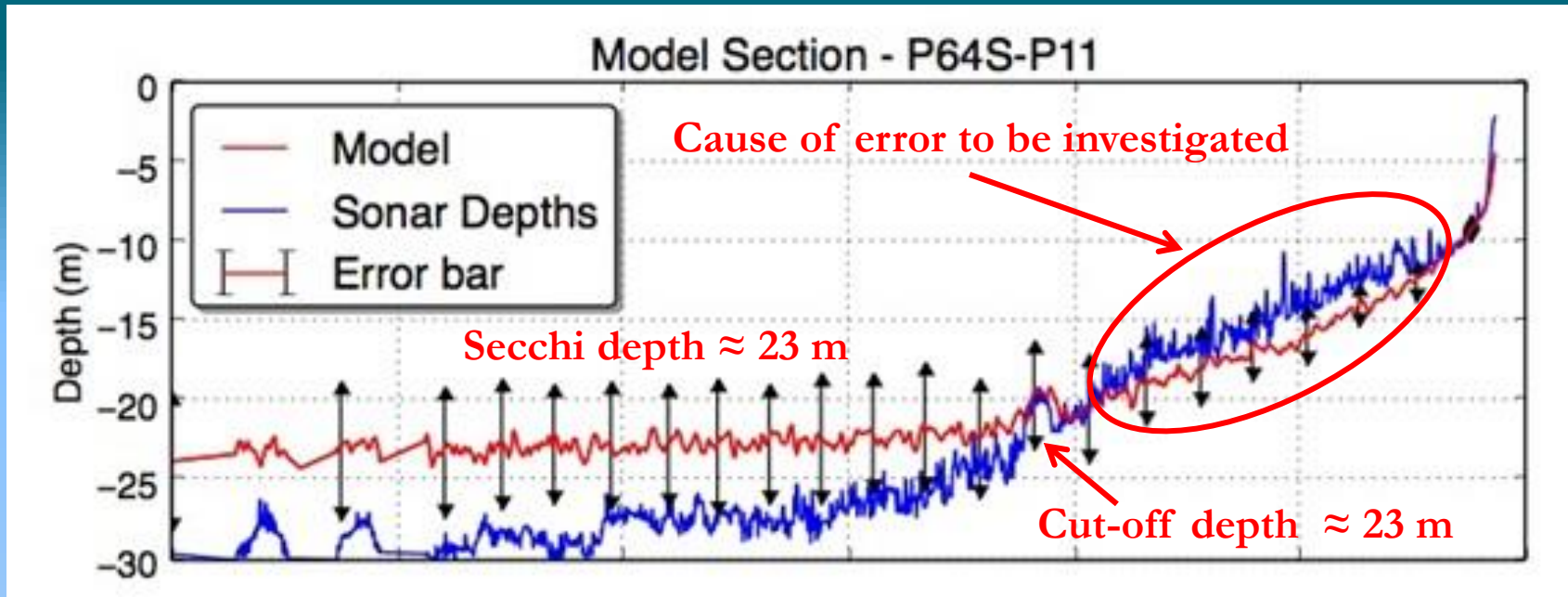
- Optimal model performances require suitable environment.
- Giving preference to HR images is disputable. Short revisit time satellites such as Sentinel 2 can often offer better value-for-money.
- Only select good images (yes we can!).
- Glint is to be avoided.

Uncertainties and validation



- Each pixel is associated with an uncertainty.
- Water optical properties help determine a “cut-off” depth above which data can be validated.
- When datasets have been validated, uncertainties can be plotted on the chart’s uncertainty diagram.

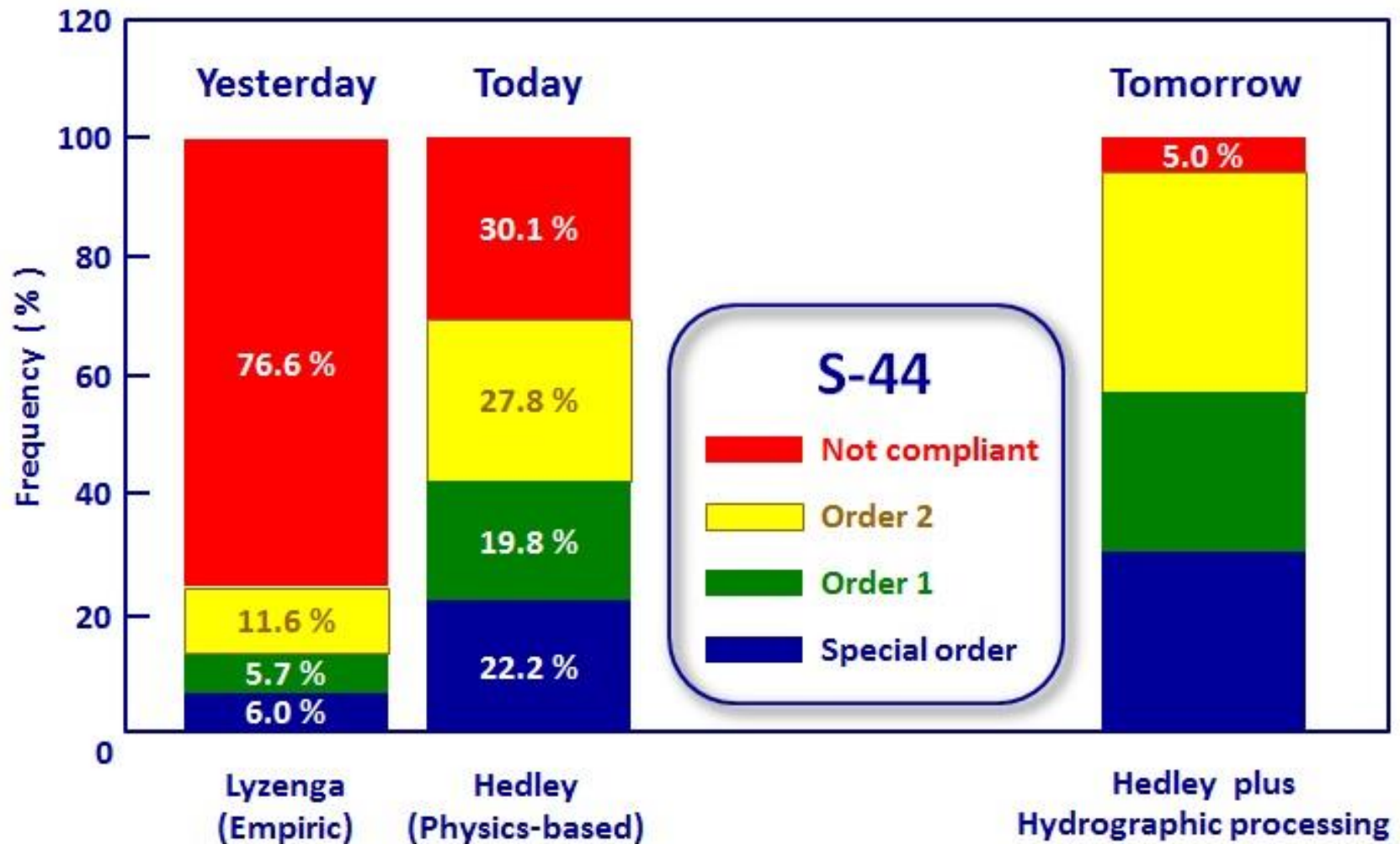
Challenge by Hydrographers can lead to improvements, e.g. SHOM: “*error bars and sonar depths split at 12 m*”



- To ARGANS, the “error bars” only reflect uncertainties, not systematic errors due to various causes, e.g. atmospheric correction, offsets, sea bottom classification, etc.
- Here, the systematic error causing the split between 12 m and 23 m can be investigated and corrected.
- Cut-off depth clearly visible.



SDB Compliance with S-44



An Optical Wire Sweep ?

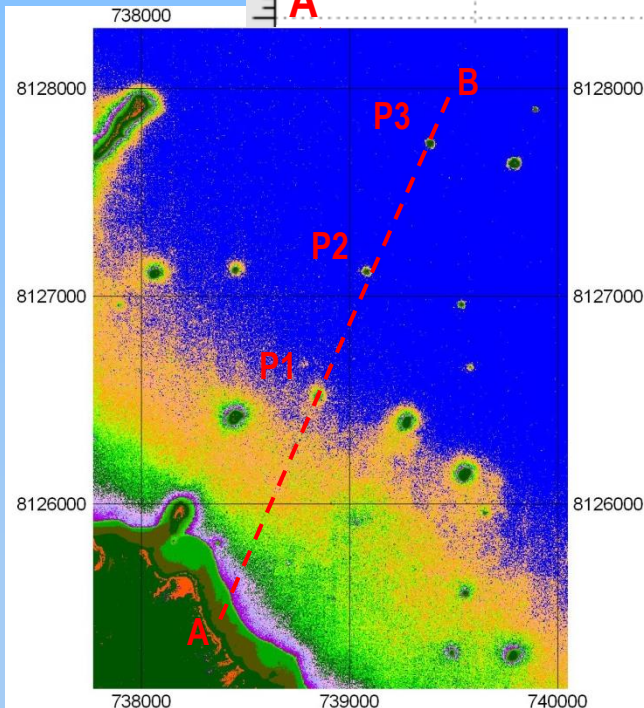
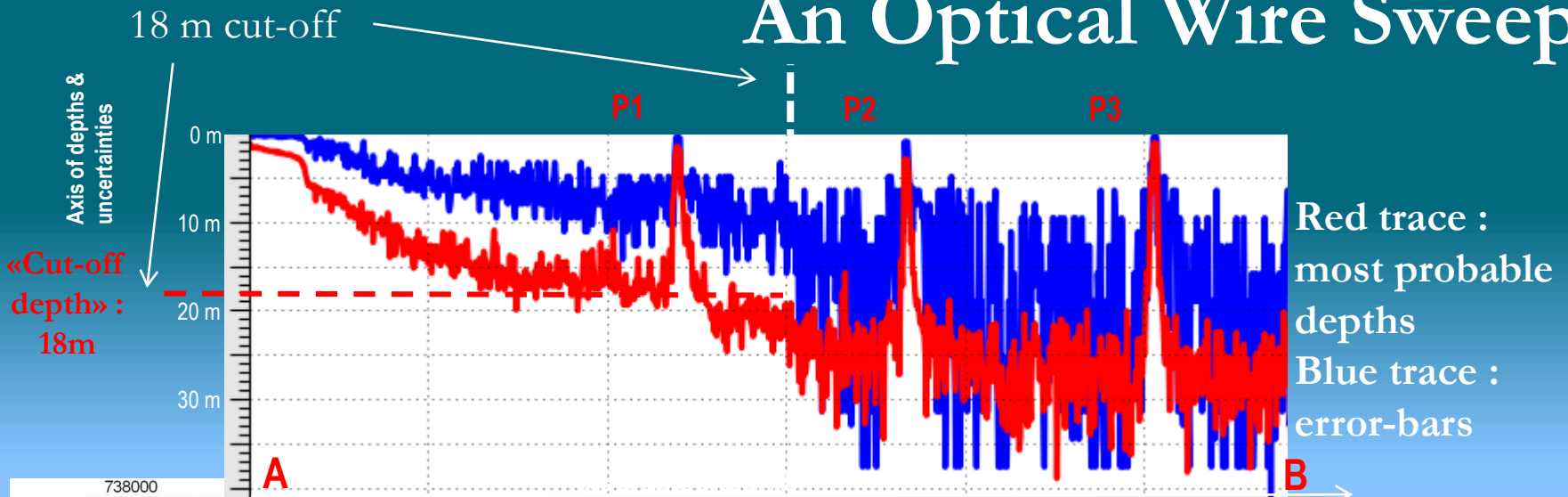
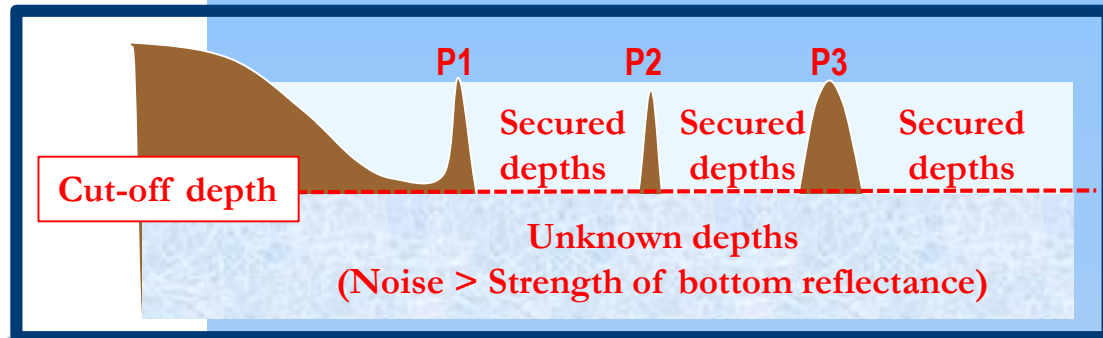
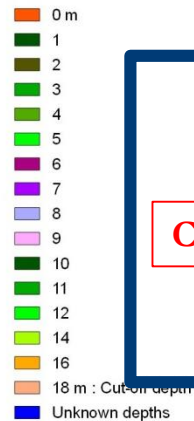


Image Pléiades traitée du 20/10/2014



Conclusion

- Depth accuracy wise, SDB might never be fully compliant with S-44, but it could provide a 95% safety of navigation guarantee by developing the “optical wire sweep” concept.
- There are three areas where significant SDB progress could be made:
 1. Equations, ATBDs, IT and Physics-based methods ☹ ☹
 2. Images optimisation (intelligent selection, high revisit rate, Cal/Val, atmospheric corrections...) ☺ ☺
 3. **Hydrographic handling**, datasets filtering and qualification ☺ ☺ ☺
- Priority should be placed on R & D and standardisation, until validated and usable products are made available.



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FIG/IHO/ICA Cat. A

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Any questions?