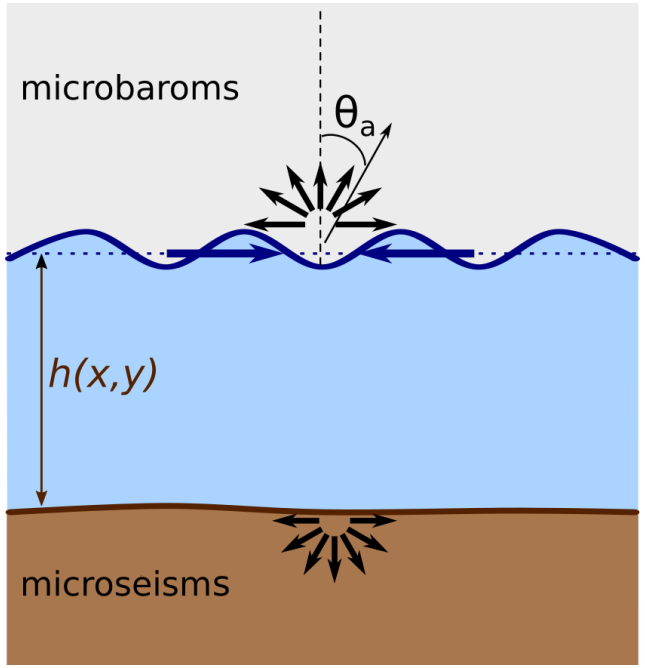
ARROW
ATMOSPHERIC INFRASOUND BY OCEAN WAVES

Products presentation

M. De Carlo, M. Accensi, F. Ardhuin, A. Le Pichon, C. Listowski

EGU 2022 – SESSION AS1.6 – EGU22-7564

Introduction

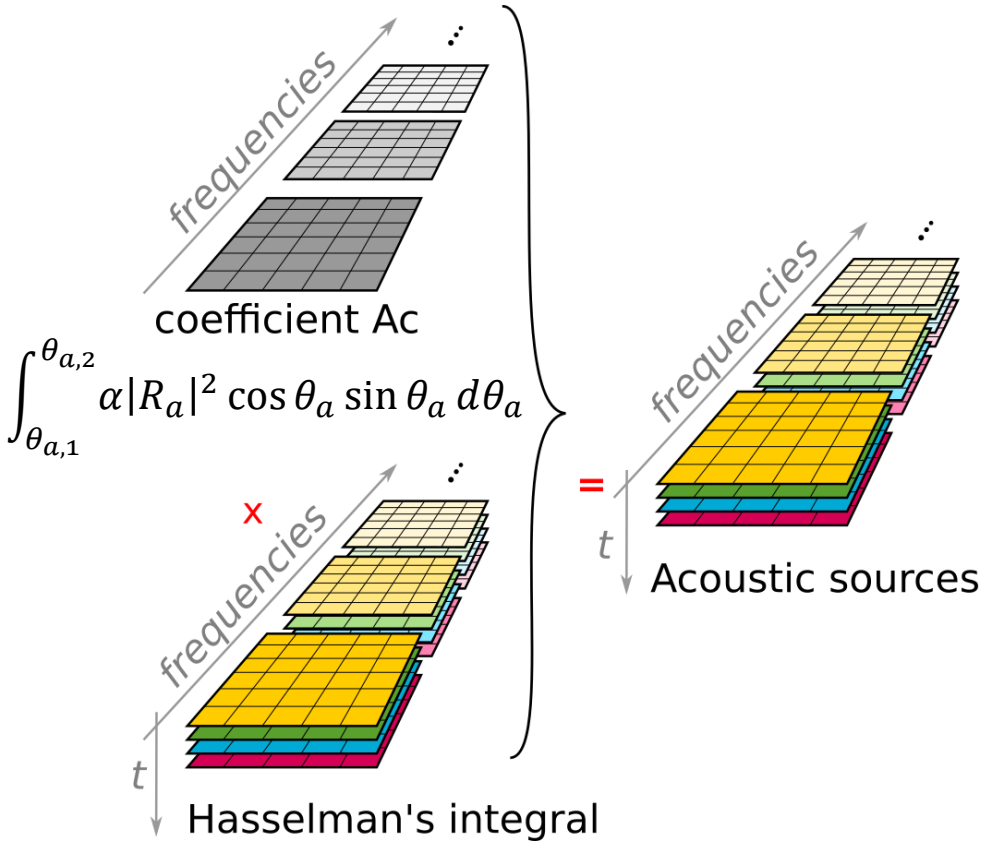


- Microbaroms are infrasound noise originating from the ocean and **detected globally**
- These acoustic waves are generated during 2nd order **interactions** of **almost opposite** wave trains.
- To quantify this wave-wave interaction, the **Hasselman integral** is used (Hasselman 1963):

$$H(f) = \int_0^{\pi} E(f,\theta)E(f,\theta+\pi)d\theta$$

Introduction

- In general, acoustic power emitted between vertical angles $\theta_{a,1}$ and $\theta_{a,2}$ can write as **Ac * H(f)** where Ac is a coefficient obtained after integration between $\theta_{a,1}$ and $\theta_{a,2}$ (cf. De Carlo et al. 2020)
- The choice of $\theta_{a,1}$ and $\theta_{a,2}$ **depends on** the purpose of the **study** and/or the **propagation** used



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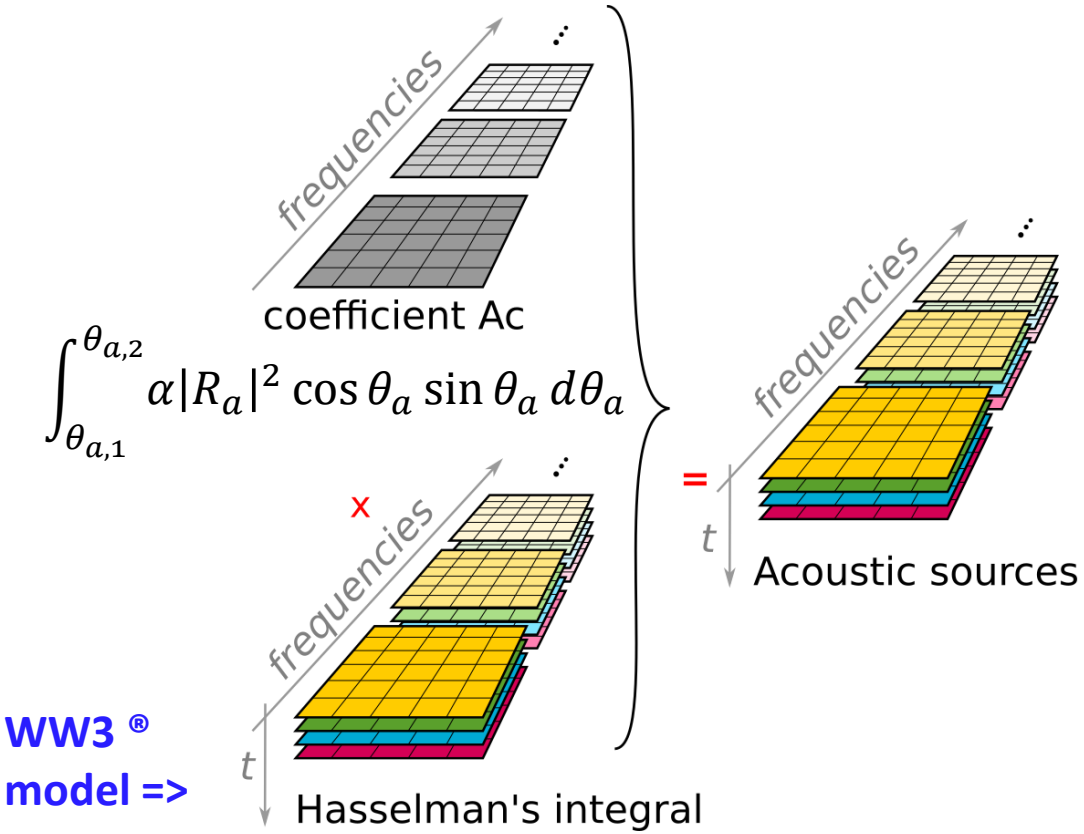
Introduction – General Workflow



WW3 ® model =>

$$H(f) = \int_0^{\pi} E(f,\theta)E(f,\theta+\pi)d\theta$$

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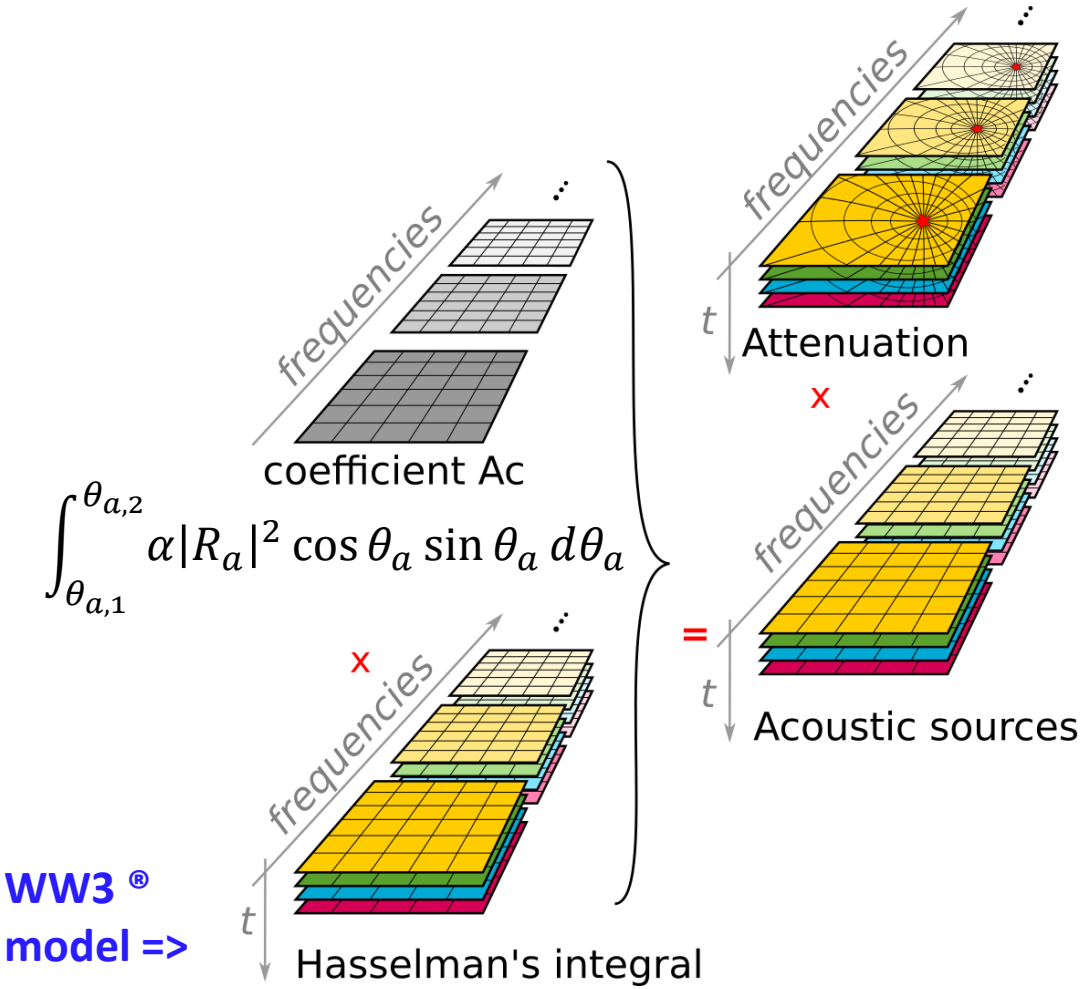

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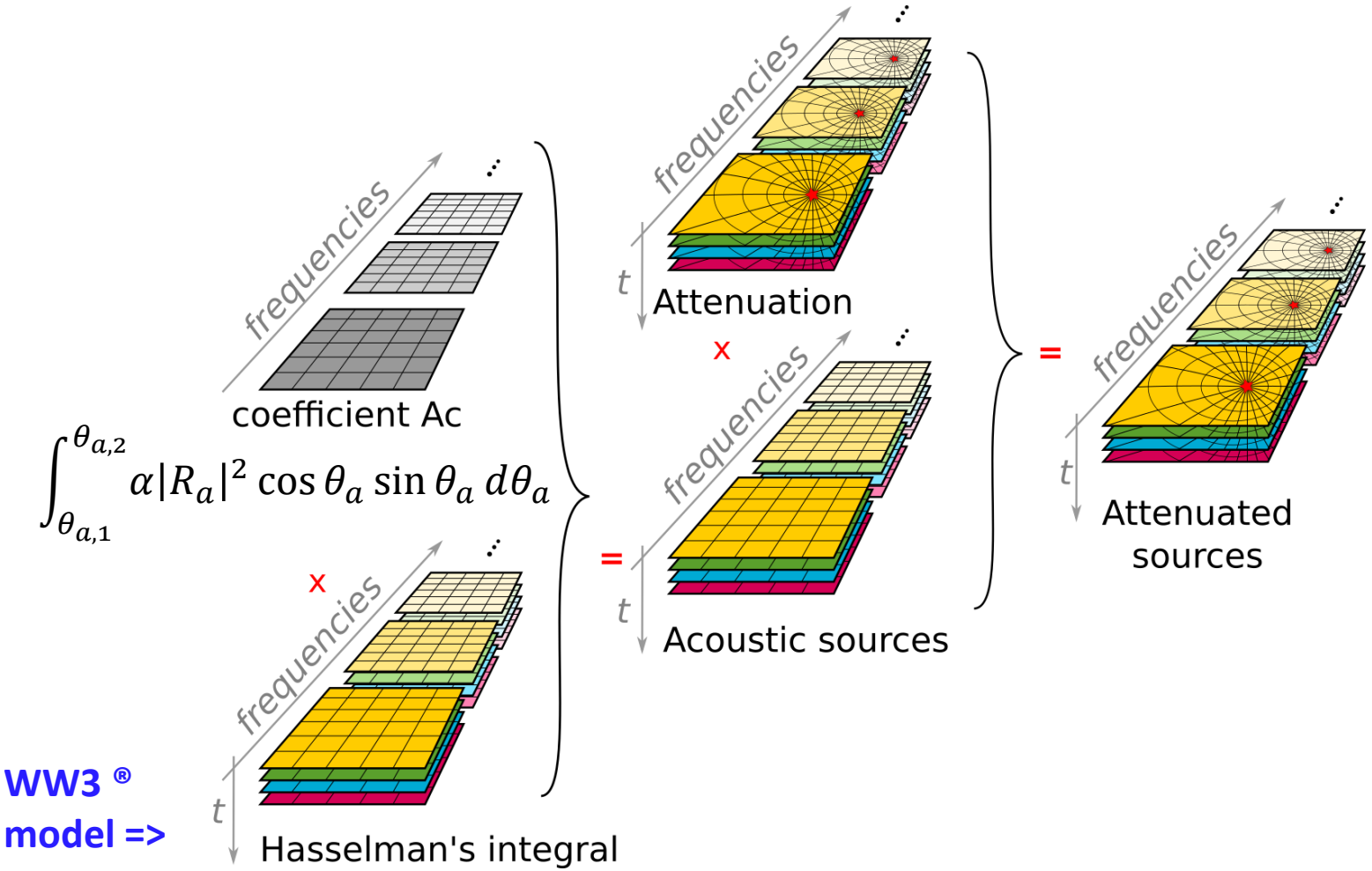
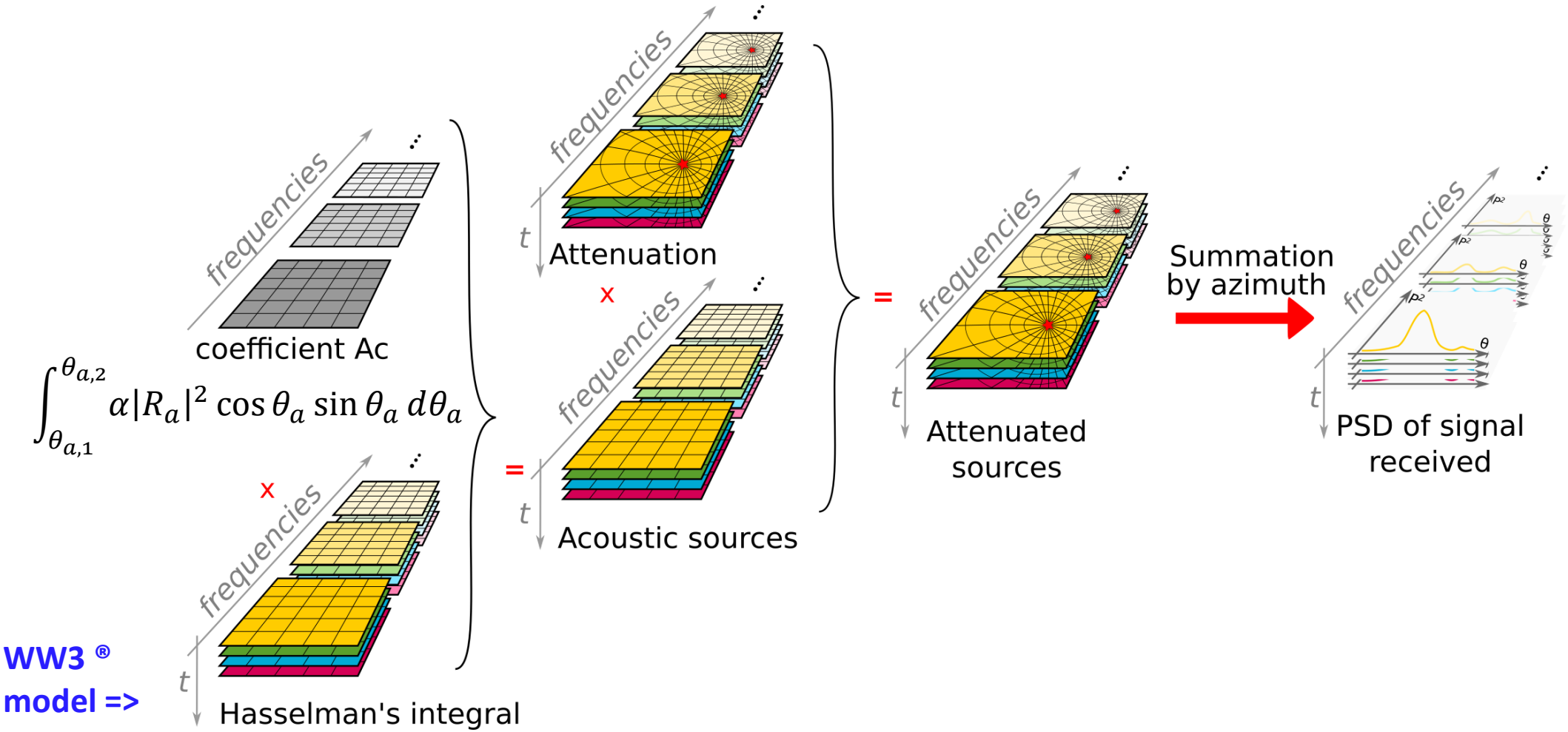
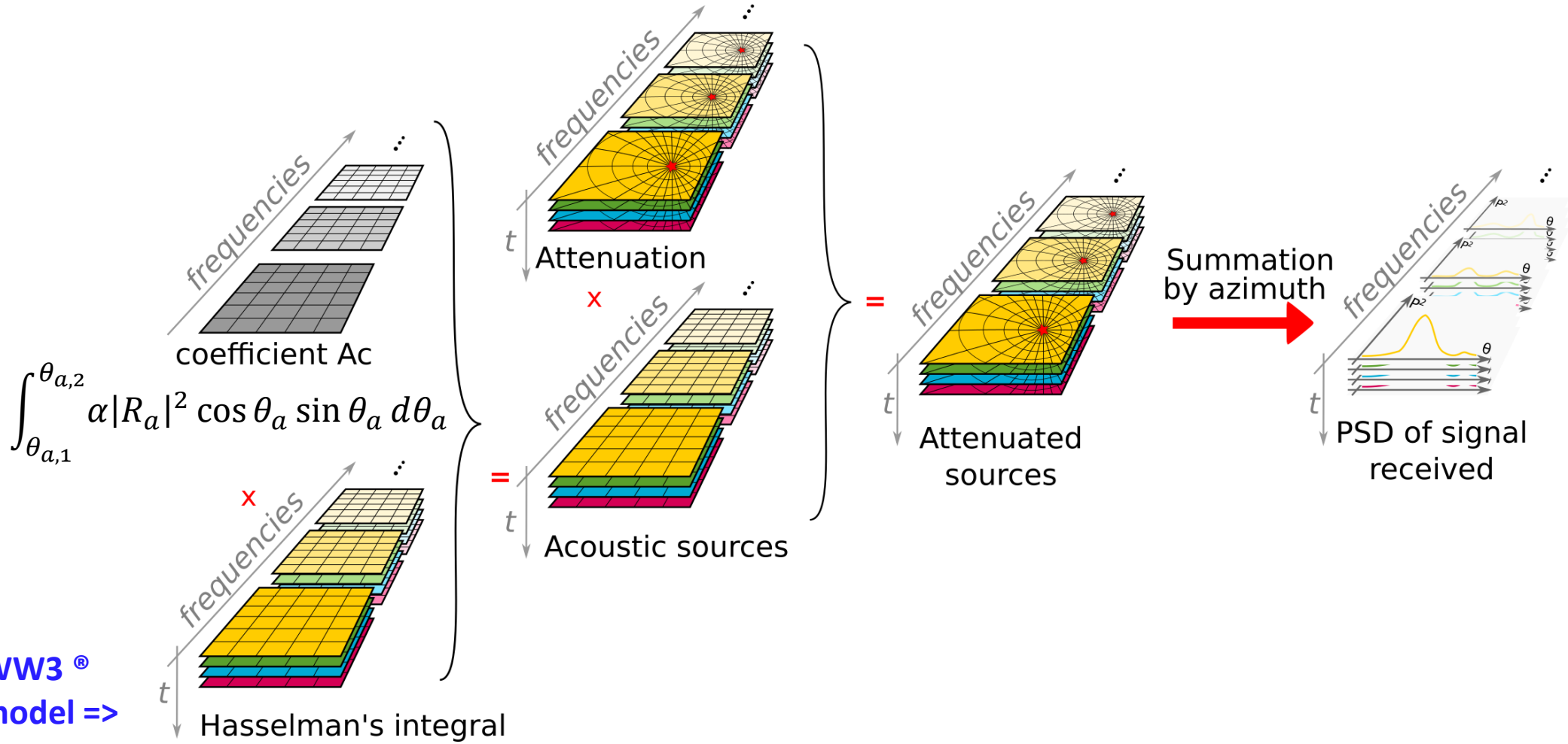


WW3 ® model =>

Introduction – General Workflow



ARROW Project



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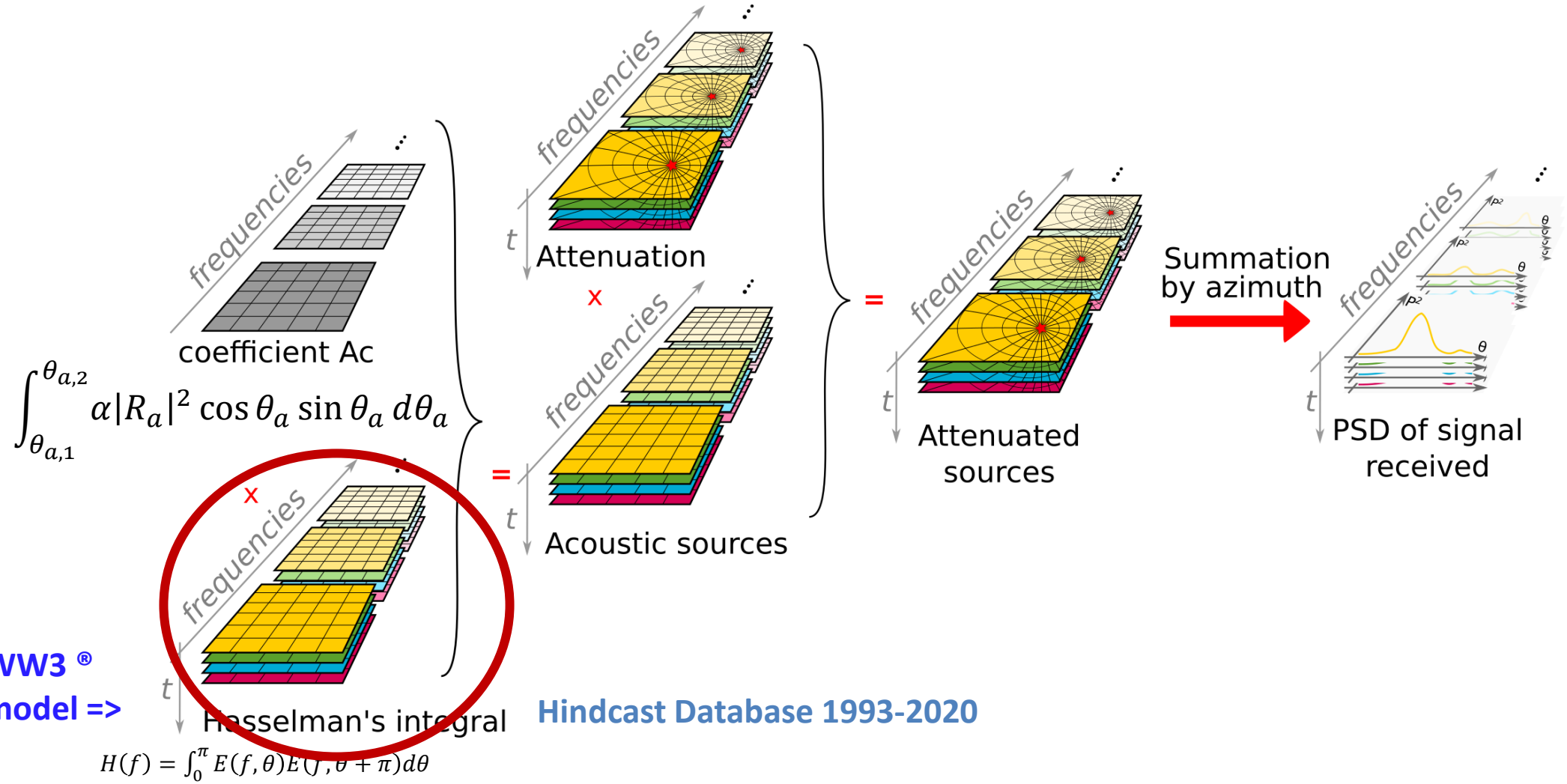

WW3 ® model =>

Hindcast Database 1993-2020

Sharing is encouraged

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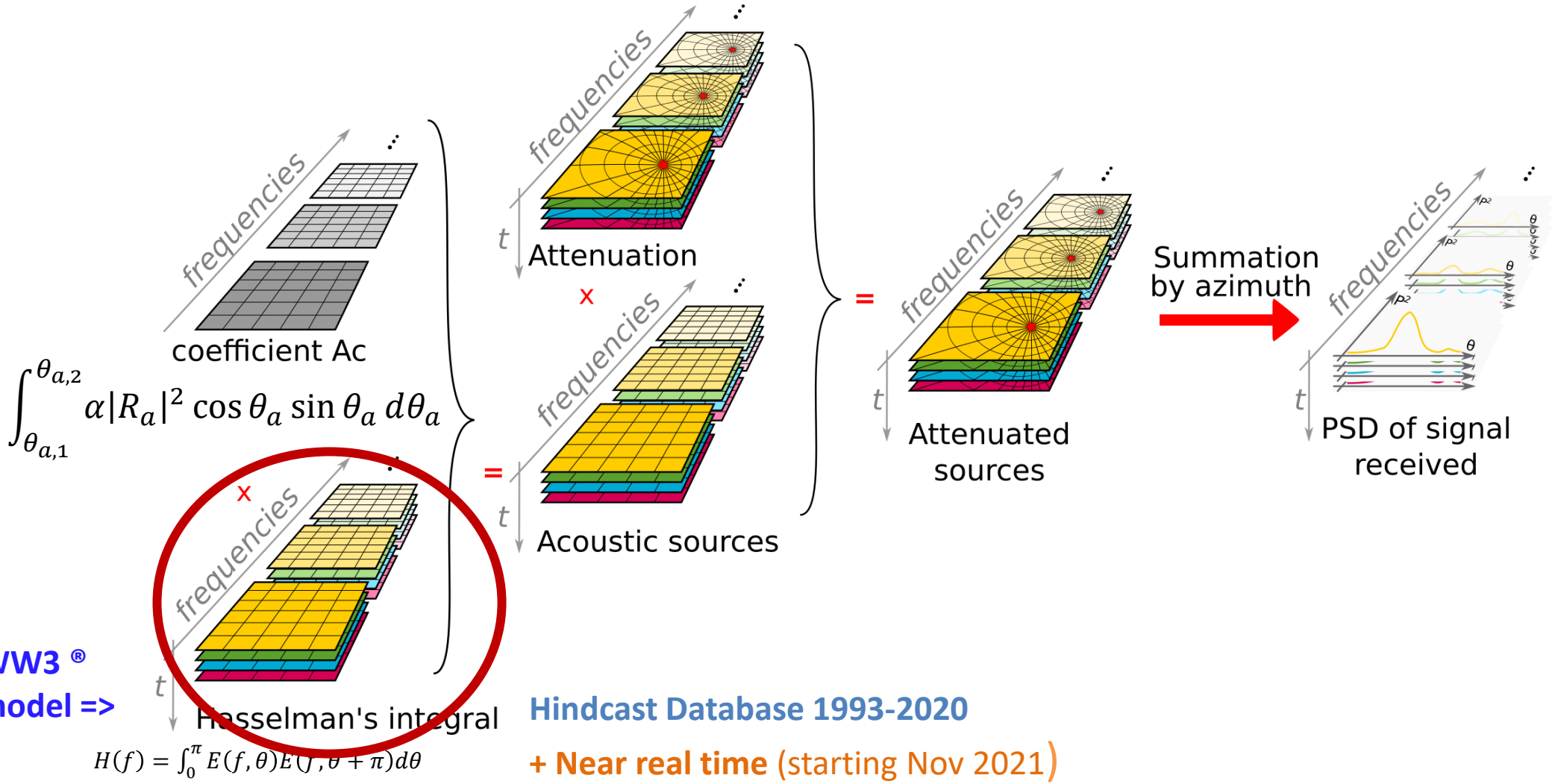

WW3 ® model =>

Hindcast Database 1993-2020

+ Near real time (starting Nov 2021)

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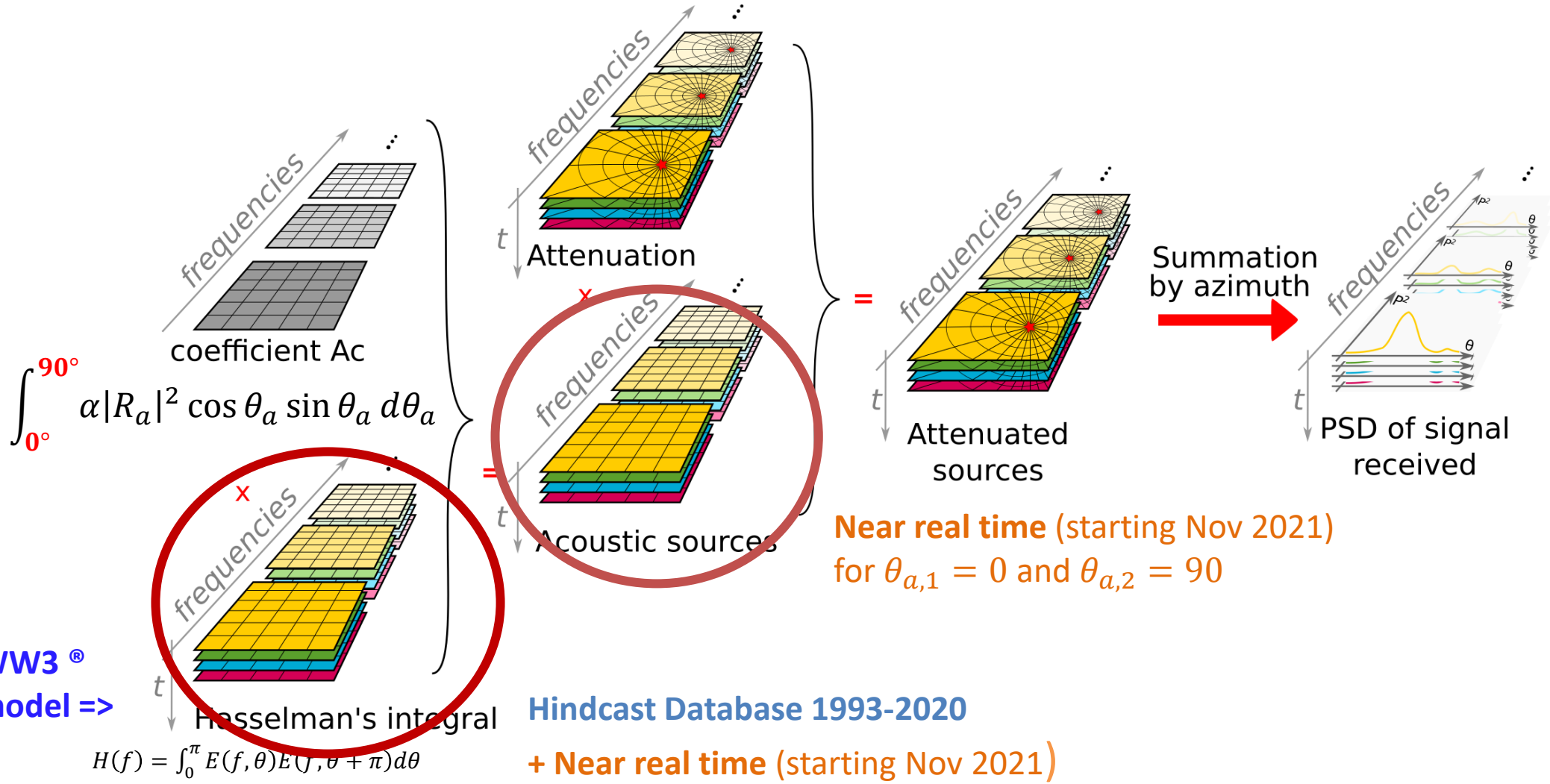

Near real time (starting Nov 2021)
for $\theta_{a,1} = 0$ and $\theta_{a,2} = 90$

WW3 ®
model =>

Hindcast Database 1993-2020

+ Near real time (starting Nov 2021)

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Reanalysis 1993 - 2020

Hasselman integral

- Based on the state-of-the-art wave action model **WW3** ® with the more recent parameterization Alday et al 2021.
- Model **performance validated** against buoys and satellite data (Alday et al 2021).
- Source winds (model input): **ERA5** from ECMWF
- **Resolutions** : spatial : 0.5°x 0.5°, time : 3 hours

- Data access : ftp://ftp.ifremer.fr/ifremer/dataref/ww3/GLOBMULTI_ERA5_GLOBCUR_01/GLOB-30M/YYYY/FIELD_NC/*_p2l.nc

- The hindcast dataset must be cited with the following reference :

Accensi Mickael (2020). GLOBMULTI_ERA5_GLOBCUR_01. IFREMER. https://doi.org/10.12770/857a3337-f59a-481a-bf98-5561e8b61e7b

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Near Real Time

Hasselman integral
+ acoustic sources [0°,90°]

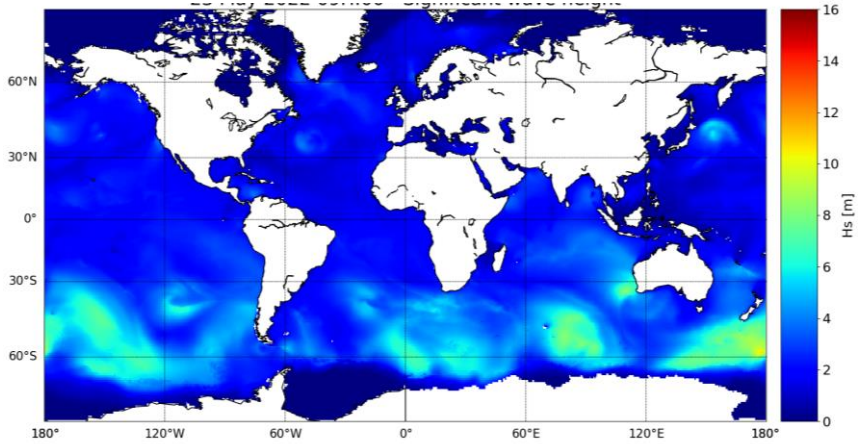
- Based on the state-of-the-art wave action model **WW3** ® with the more recent parameterization Alday et al 2021.
- Source winds (model input): **IFS** from ECMWF
- **Resolutions** : spatial : 0.5°x 0.5°, time : 3 hours

- Data access :
  - ✓ **Hasselman integral (~12h delay, update every 12h) :**
    ftp://ftp.ifremer.fr/ifremer/ww3/PROJECT/ARROW/REALTIME/ARROW/GLOB-30M/FIELD_NC/best_estimate/YYYY/*_p2l.nc
  - ✓ **Acoustic sources (6 months delay):**
    ftp://ftp.ifremer.fr/ifremer/ww3/PROJECT/ARROW/REALTIME/public/FIELD_NC/best_estimate/YYYY/*_ac.nc
  - ✓ Diagnosis images (Wave height, wind and Hasselman integral):
    ftp://ftp.ifremer.fr/ifremer/ww3/PROJECT/ARROW/REALTIME/ARROW/GLOB-30M/PNG/best_estimate/ *_hs.png, *_wnd.png, *_p2l.png

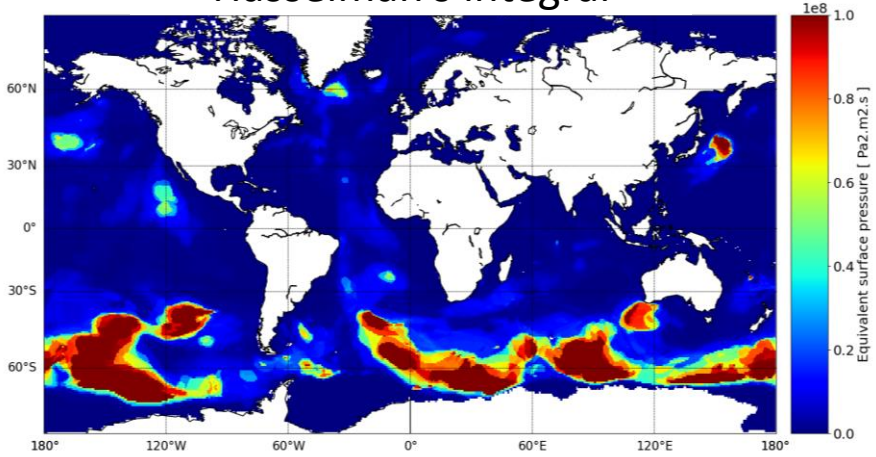
Perspectives

- When all reanalysis sources are available, the **year 2021** will be computed to be **part of the Hindcast database**.
- Comparisons : **reanalysis vs forecast**.
- Database with a configuration accounting for **0 coastal reflection** ?

Wave height



Hasselman's integral



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THANK YOU FOR YOUR ATTENTION !