



From VHF packets to Scientific products

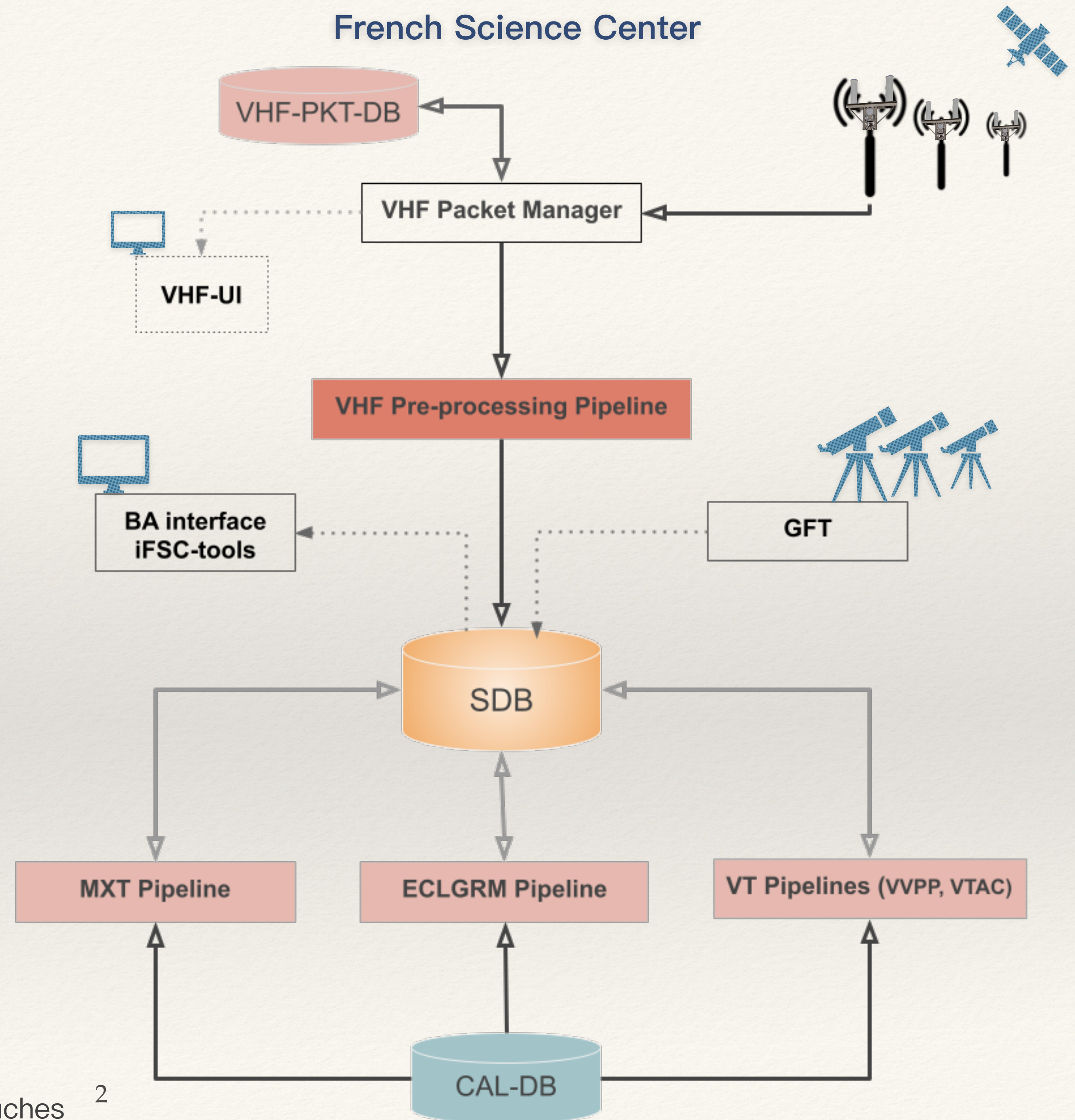
Tatyana Sadibekova (AIM/CEA) on behalf of SVOM Collaboration



SVOM Burst Advocates Workshop, 16—20 mai 2022, Les Houches

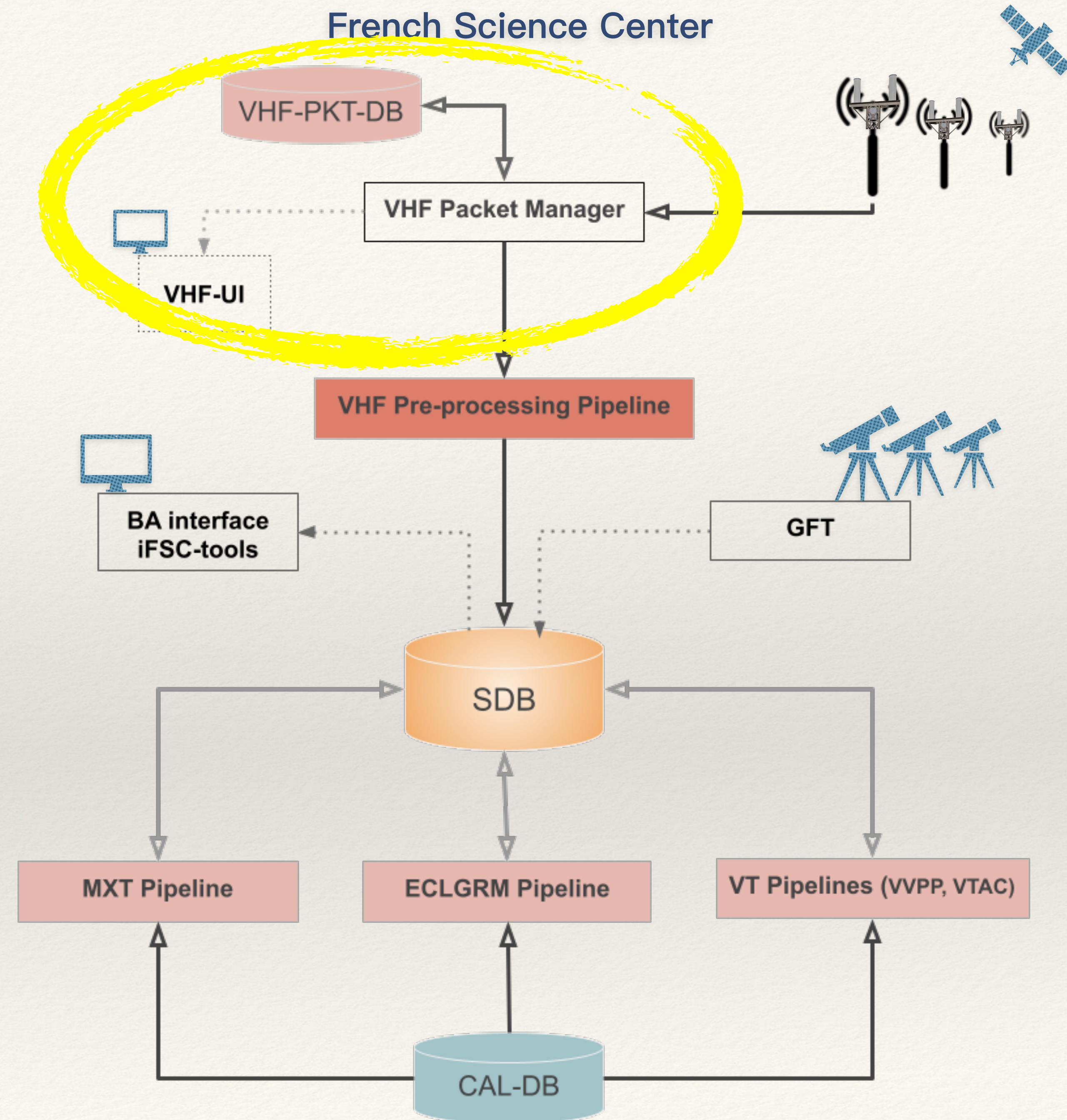
VHF workflow

- VHF packets management
- VHF packets pre-processing
- Scientific analysis
- BA interface display



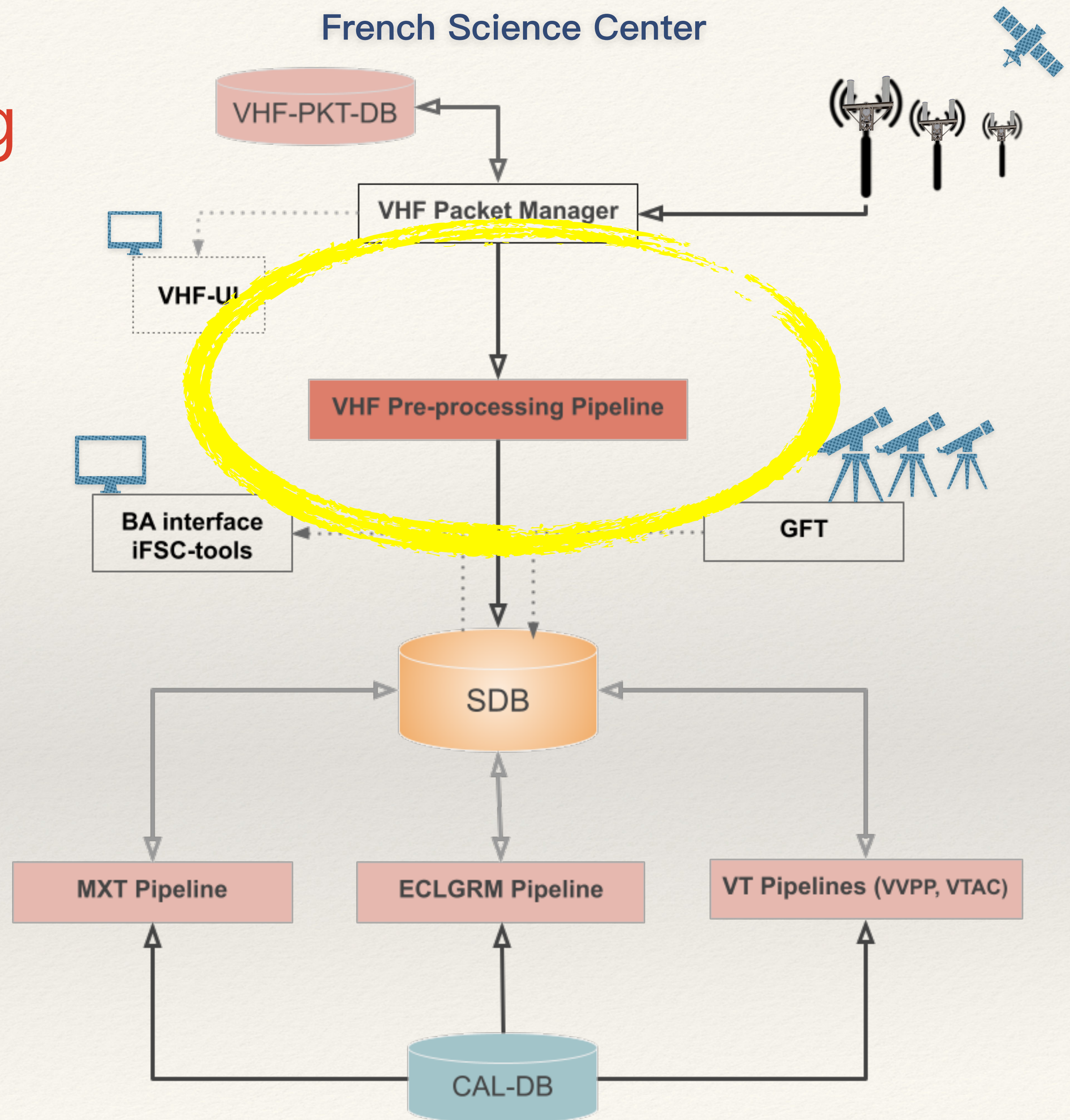
VHF packet management

- All packets received from the VHF stations are handled by **VHF Packet Management service**
- Binary packets are registered, decoded and stored in JSON format in **VHF-PKT-DB**.
- REST web service is deployed for the outside clients for the packets uploading
- In GRB mode, **BURST_ID** is created using the Tb0 retrieved from the first received alert packet (ECLAIRs/GRM)
- After receiving the alert, the orchestrator runs first the **VHF pre-processing pipeline** specifying current BURST_ID



VHF packets pre-processing

- Packet sequences retrieved from the VHF-PKT-DB in JSON
- Data from same type of packets are grouped.
- The content is reconstructed and units conversion applied if required.
- Pre-processed content are formatted in the FITS products. The format is adapted to the following science processing.
- The FITS products are pushed in **Science Data Base** (SDB)
- Products suppose to be updated with every new received packets for the same sequence (APID)



Science Data Base


[Home](#)
[Search products](#)
[How to export](#)

Welcome to the SVOM-SDB

This service provides several sub-services to interact with the database. Here is a brief presentation of these sub-services:

- [/import](#) => This sub-service allows you to import data L0, L1 or SR3/SR4
- [/export-rest](#) => This sub-service allows you to request and export data from the database in json format with a specific URL. To build this URL you could [go to search form](#)



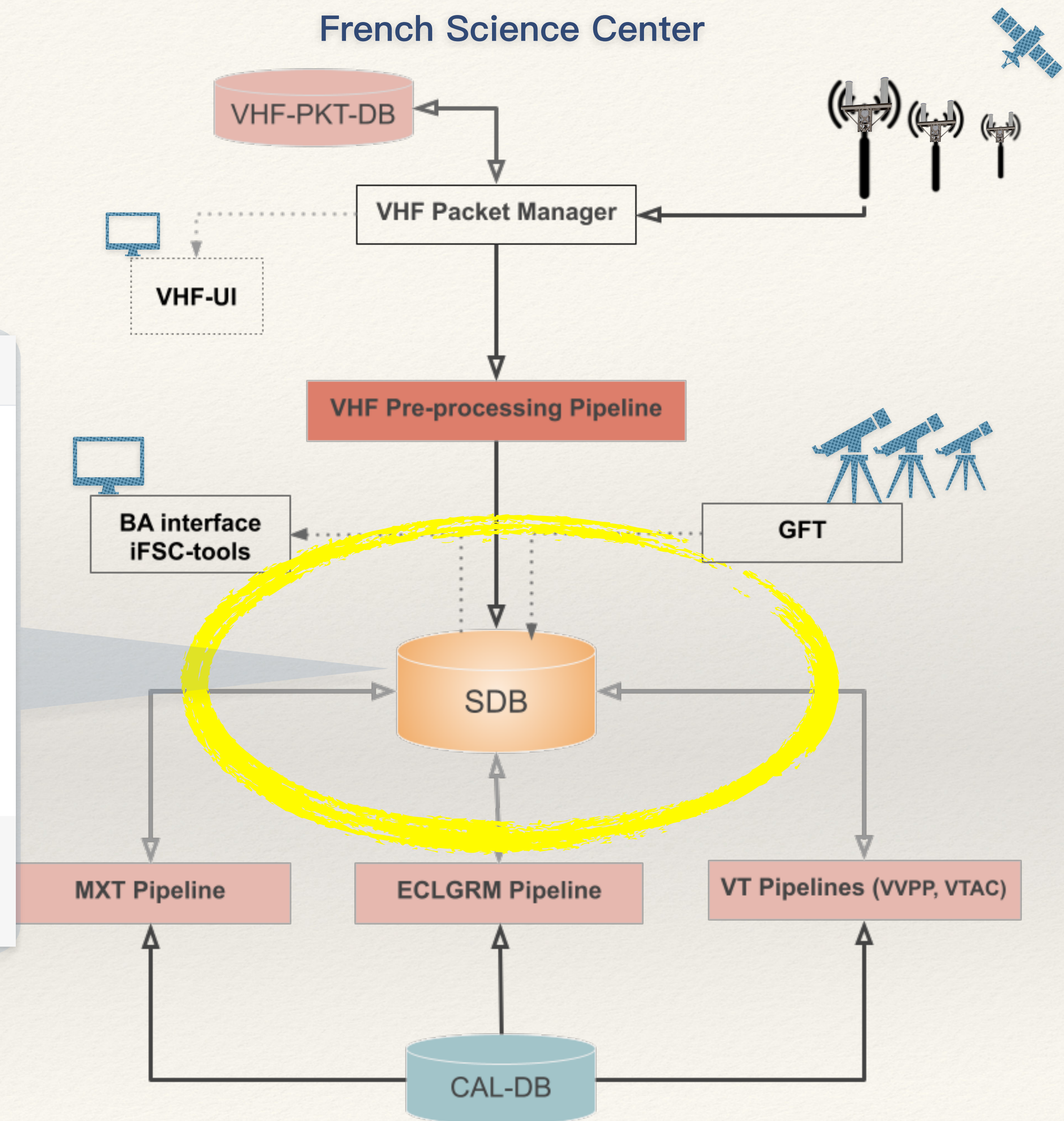
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Currently based on anis-client v3.7.0. Code licensed CeCILL.



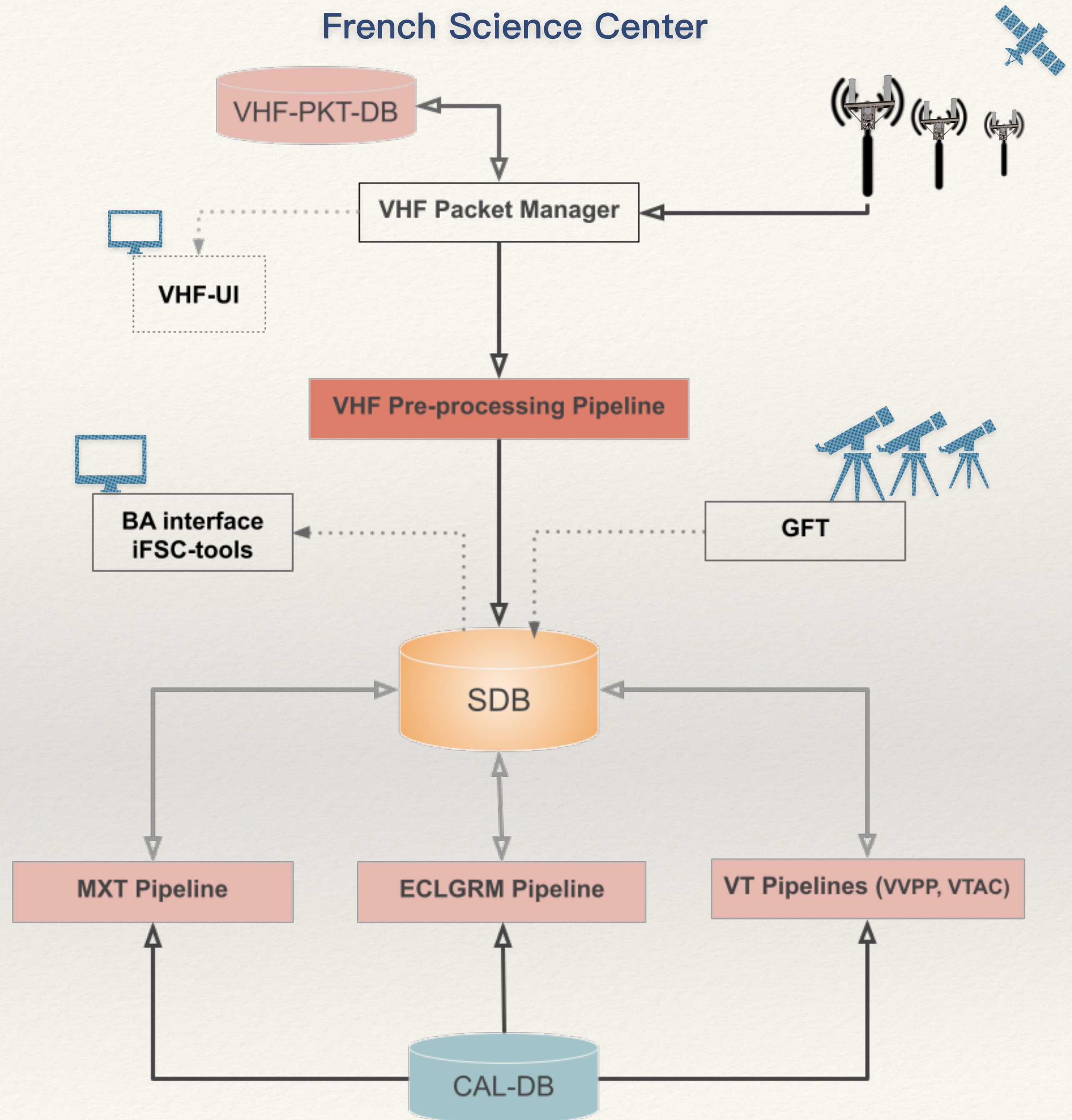






Science Products

- Fits format
- Compliant with OGIP and astronomical standards
- Data model centralized management
- Versioning and CI



VHF pre-processing products



ECLAIRS/GRM :

- [TT, QPO, QCL,] _ ECL/GRM
(Quick trigger params: Tb0, R.A. Dec, SNR)
- OBALERT_ECL/GRM (Alert Params)
- OBALERTD_ECL (Alert Description)
- OBLC_ECL/GRM (Light Curves)

PDPU:

PDPU_GRB (Slew request params)

MXT:

- OBPOS_MXT (X-ray candidates positions)
- OBPHOTL_MXT (Photon list)

VT:

- OBATT_VT (Attitude chart)
- OBFIND_VT (Finding chart)
- OBIM1B_VT (1 bit sub-images)

ECLGRM products

Input :

- [TT, QPO, QCL,] _ ECL/GRM
(Tb0, R.A. Dec, SNR)
- OBLC_ECL/GRM (Light Curves)
- OBALERT_ECL/GRM (Alert Params)
- OBALERTD_ECL (Alert Description)

ECLGRM pipelines

iFSC tools

eclgrm-monitor

X-band

ECLGRM–VHF Pipeline Scientific Products for BA (via iFSC–tools)



Products	Definition
• QLC_ECL/GRM	ECLAIRs and GRM background–subtracted light curves in selected energy bands ; GRB detection significance
• QPF_ECL/GRM	ECLAIRs and GRM peak fluxes in selected energy bands
• QT90_ECL/GRM	quick estimate of the duration in ECLAIRs/GRM
• QHR_ECL/GRM, QHR_ECLGRM	ECLAIRs (and/or) GRM quick hardness ratio
• CRCLASS	Crude classification from duration and hardness in ECLAIRs (and/or) GRM. Probable nature of burst (GRB, magnetar, solar flare, TGF, particle event, etc)

ECLGRM–Xband Pipeline Scientific Products for BA (via iFSC–tools)

Products	Defintion
PO_ECL	final GRB position from ECLAIRs
CLC_ECL/ CLC_ECLGRM_GRM	ECL and GRM light curves and background–subtracted light curves in selected energy bands ; GRB detection significance
T90_ECL	final GRB duration in ECLAIRs
SP_ECL/SP_ECLGRM	spectral fits results for ECL–only analysis and ECL+GRM joint analysis
LC_ECL	ECLAIRs light curve in physical units
HR_ECL/HR_ECLGRM	Hardness ratios (selected results)
LAG_ECL/LAG_ECLGRM	Spectral lags (selected results)

ECLGRM Pipeline results for IS (via eclgrm-monitor)

All scientific products from eclgrm-vhf pipeline:

- ECL: QLC_ECL, QT90_ECL, QPF_ECL, QHR_ECL, CRCLASS
- GRM: QLC_GRM, QT90_GRM, QPF_GRM, QHR_GRM, CRCLASS
- ECL+GRM: QHR_ECLGRM, CRCLASS

All scientific products from eclgrm-xband pipeline:

- ECL-only analysis: PO_ECL, CLC_ECL, T90_ECL, CSP_ECL_ECL, BCSP_ECL_ECL, SP_ECL, MCSP_ECL_ECL, HR_ECL, LAG_ECL
- ECL+GRM joint analysis: CLC_ECLGRM_GRM, CSP_ECLGRM_ECL, CSP_ECLGRM_GRDi, BCSP_ECLGRM_ECL, BCSP_ECLGRM_GRDi, SP_ECLGRM, MCSP_ECLGRM_ECL, MCSP_ECLGRM_GRDi, HR_ECLGRM, LAG_ECLGRM

Tools for diagnosis

- Logs
- Json file containing all results
- Dynamic plots (light curves, etc.)
- Plots for all intermediate results at each step of the analyses, for example: display of Bayesian blocks analyses, of background fits, of duration measurement, spectral analysis (count spectra, fit, residuals, SED), lag analysis, etc

Interface to change and optimize the analysis parameters (e.g. tmin/max, Emin/max) and to restart the X-band analyses

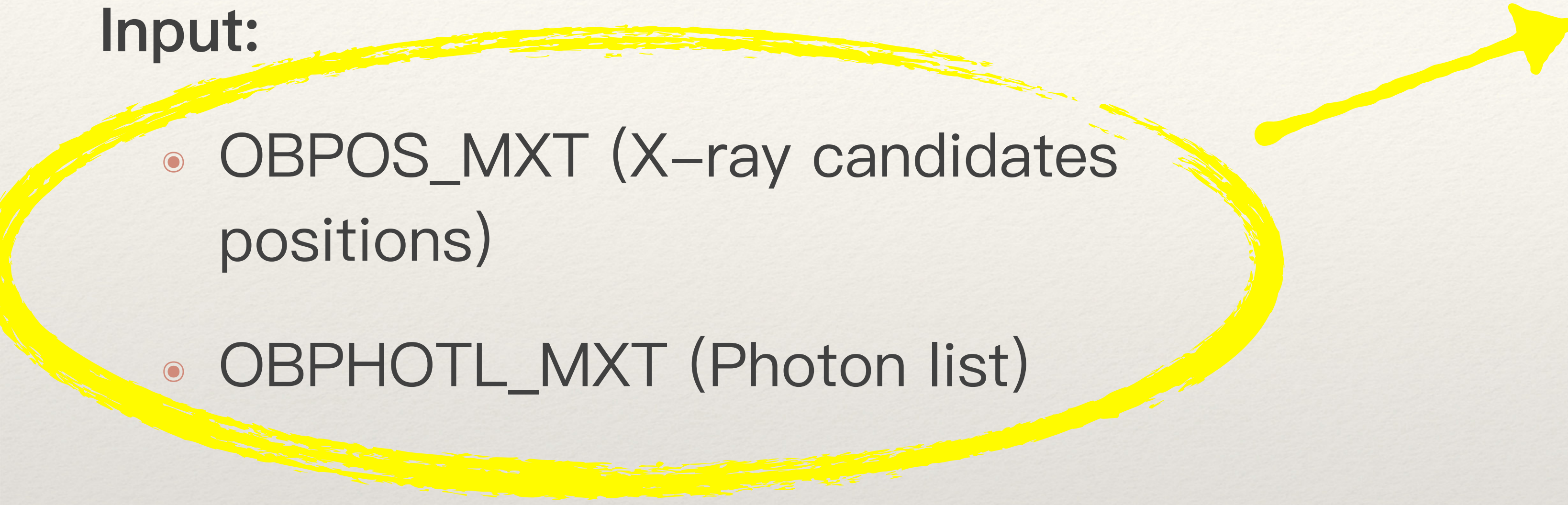
MXT products

Input:

- OBPOS_MXT (X-ray candidates positions)
- OBPHOTL_MXT (Photon list)

MXT pipelines

iFSC tools



MXT Pipeline Scientific Products for BA (via iFSC–tools)

Products	Definition
◦ QPO_MXT	Quick MXT localisation, for the detections found in the FoV crossmatched with the best ECLAIRs localisation
◦ QLC_MXT	Quick Light Curve
◦ QTI_MXT	Quick Temporal Index, from Light Curve fitting
◦ QF_MXT	Quick Flux at detection, $SNR > 3$, use the integrated flux
◦ DT	Detection time, $SNR > 3$, use the associated time reported in the packet
◦ QSRCLIST_MXT	Quick source list
◦ QIMAGE_MXT	Quick MXT Image

VT pipelines products

Input:

- OBATT_VT (Attitude chart)
- OBFIND_VT (Finding chart)
- OBIM1B_VT (1 bit sub-images)

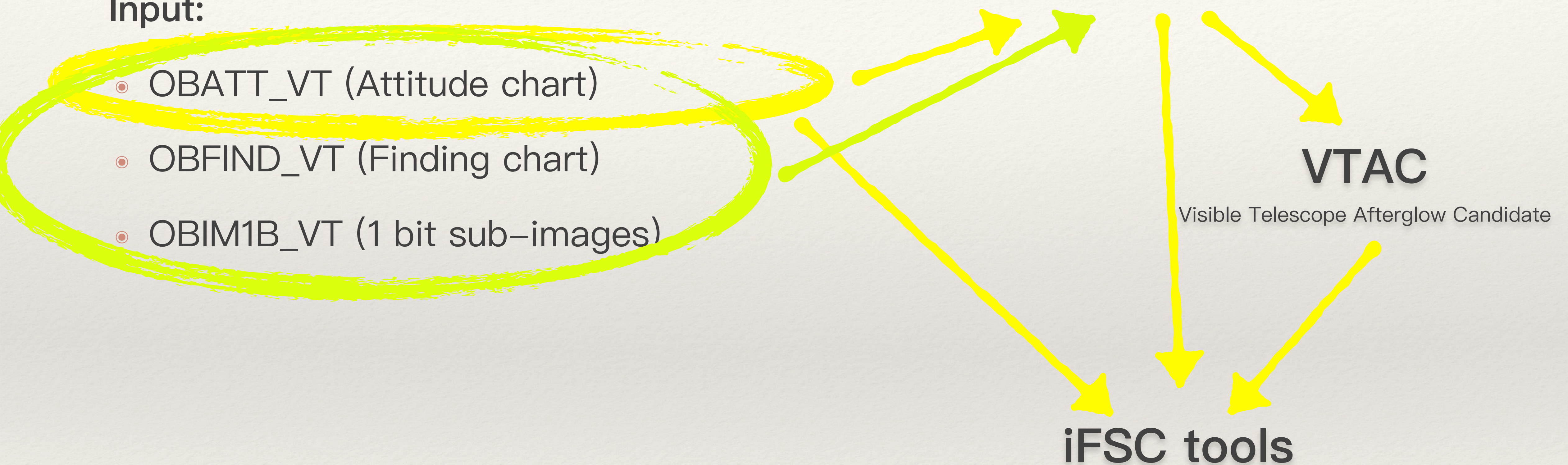
VVPP

VT VHF Pre-processing

VTAC

Visible Telescope Afterglow Candidate

iFSC tools



VVPP Pipeline Scientific Products for BA (via iFSC-tools)

Products

Definition

- **QIMAGE_VT** Quick 1bit VT Image in R and B
- **QSRCLIST_VT** Quick source list for VTAC processing
- **QSKY_VT** Sky coordinates conversion tables for MXT processing

VTAC Pipeline Scientific Products for BA (via iFSC-tools)

Products	Definition
◦ QPO_VT	Quick VT candidates positions after crossmatch QSRCLIST_VT(+QPO_MXT) with Astronomical Catalogs
◦ DT_VT	Detection time in standard frame VT
◦ QF_VT	Quick estimate of the magnitude at detection in VT (R and B channels)
◦ QLC_VT	Quick VT Light Curve (R and B channels)
◦ QTI_VT	Quick estimate of temporal index $d\text{Log}(\text{Flux})/d\text{Log}(t)$ from VT data (R and B channels)

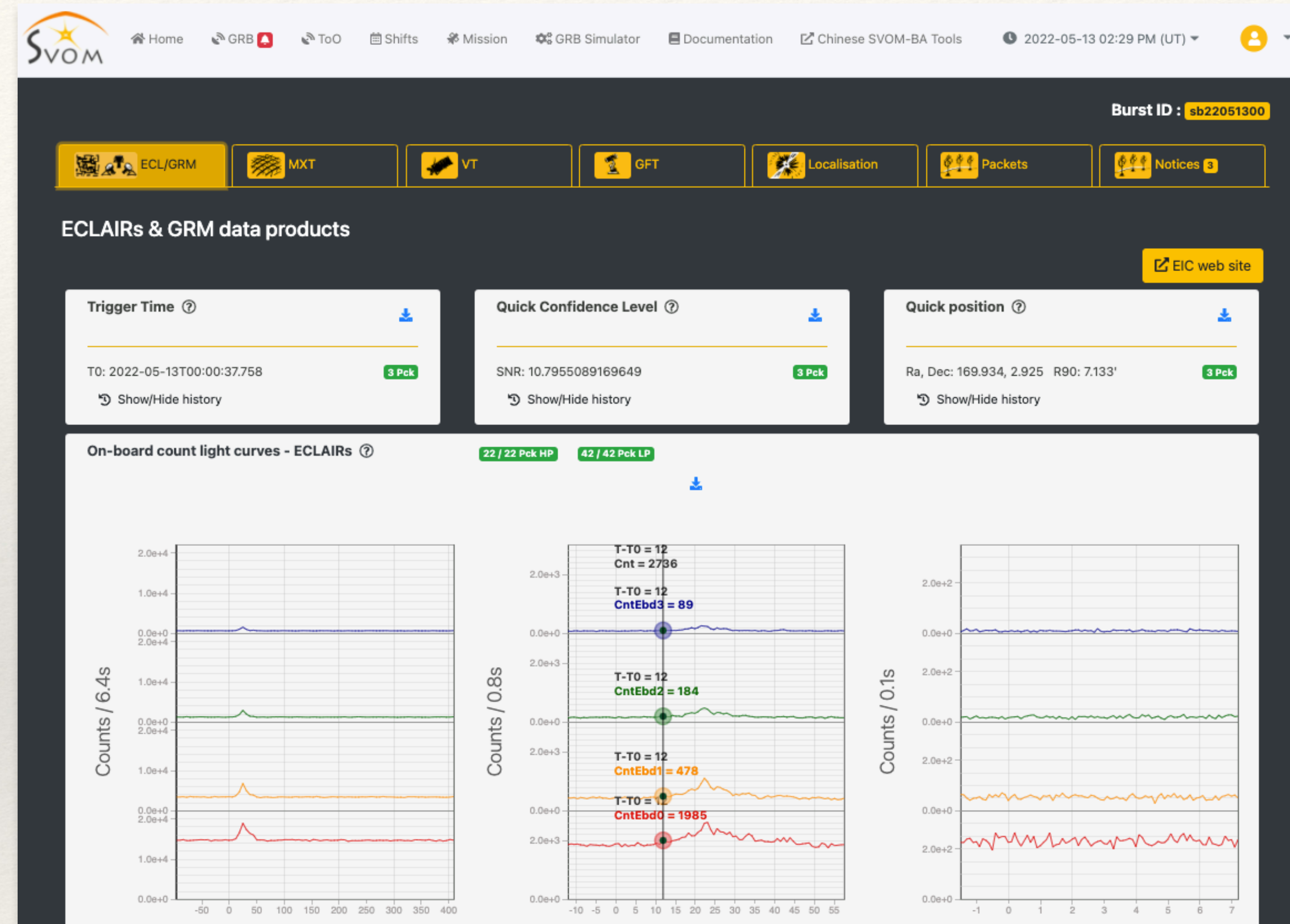
F–GFT Pipeline Scientific Products for BA (via iFSC–tools)

Products	Definition
DT_GFT_FGFT	Time of the first detection in different filters
QF_GFT_FGFT	Quick magnitude at detection in different filters
QPO_GFT_FGFT	Source position F–GFT
QLC_GFT_FGFT	Quick light curve — early light curve for each candidates detected by the F–GFT in each filter (<5min)
QTI_GFT_FGFT	Quick temporal index — the results of a fit of the QLC_GFT

The products available in iFSC–tools for the BA training week

(Scenario: ECLAIRs first)

- TT_ECL, QPO_ECL, QCL_ECL
- OBLC_ECL, OBLC_GRM
- DT_MXT, QF_MXT, QPO_MXT, QLC_MXT
- OBATT_VT, QSRCLIST_VT



Thank you



BURST_ID

Keyword: BURST_ID

Value: sbYYMMDDff

Definition: Burst identifier referred to the trigger time Tb0 in UTC

sb — SVOM Burst

YY — year

MM — month

DD — day

ff — $\text{int}(100 \cdot \text{SOD} / 86400)$ / Corresponds to a precision of 860s (SOD — seconds of day, 86400s = 24h)