

Crunching high-resolution spectra: today and tomorrow

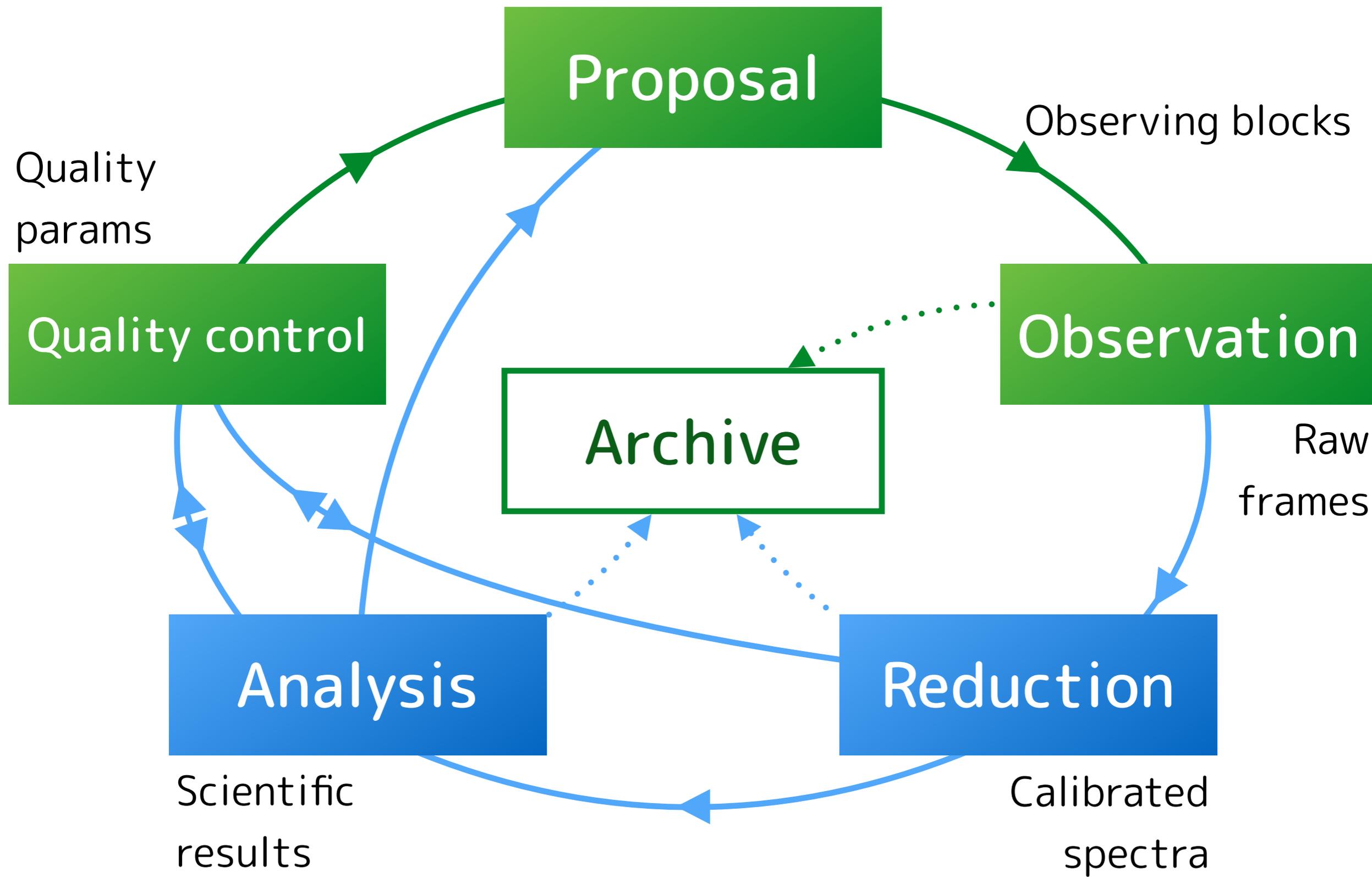
Guido Cupani, INAF-OATs



"Is it just me or have these
numbers lost their crunchiness?"

Workshop Laboratorio Spettroscopia

INAF-OAR, 11 June 2019







✓ Goal-oriented

✓ Big picture

✓ Trainable

✗ Not scalable

✗ Not reproducible

✗ No goals

✗ Workflow

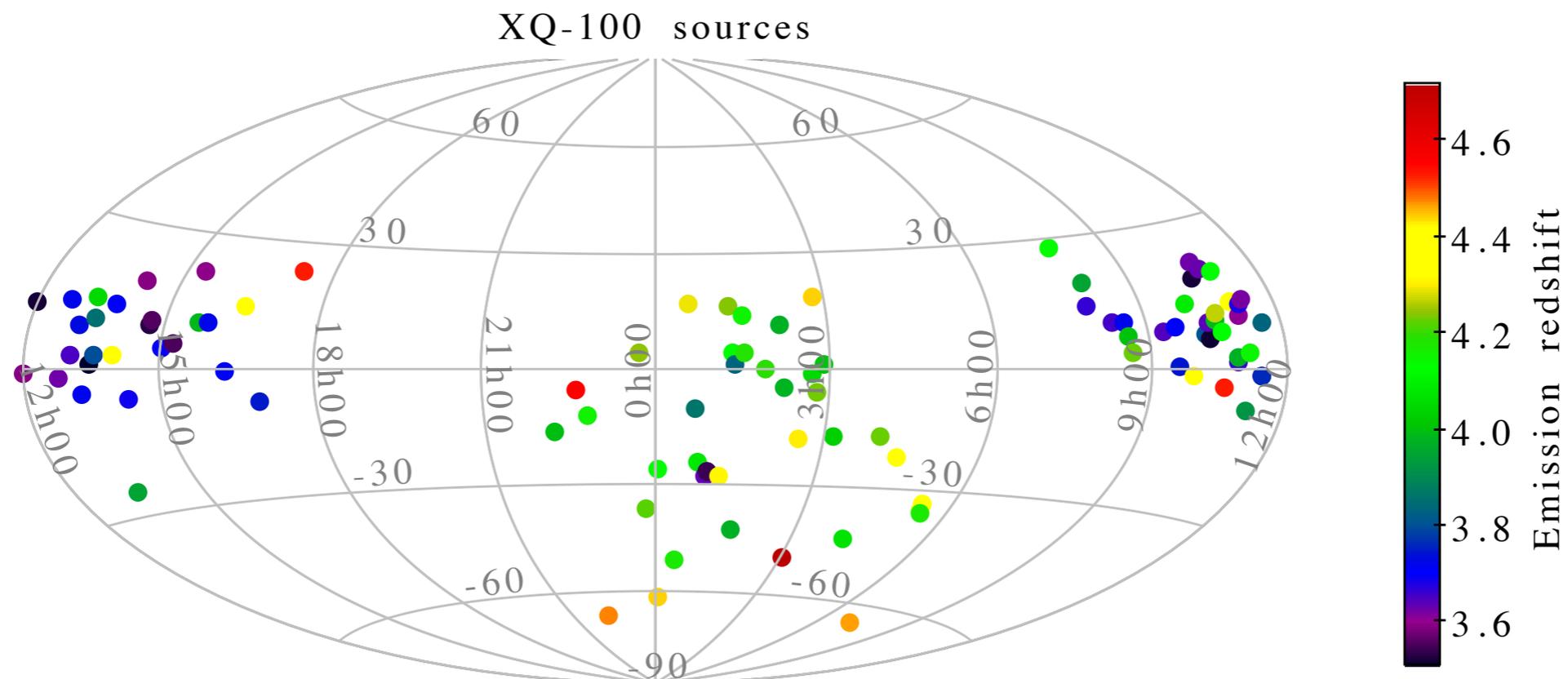
✓ Trainable

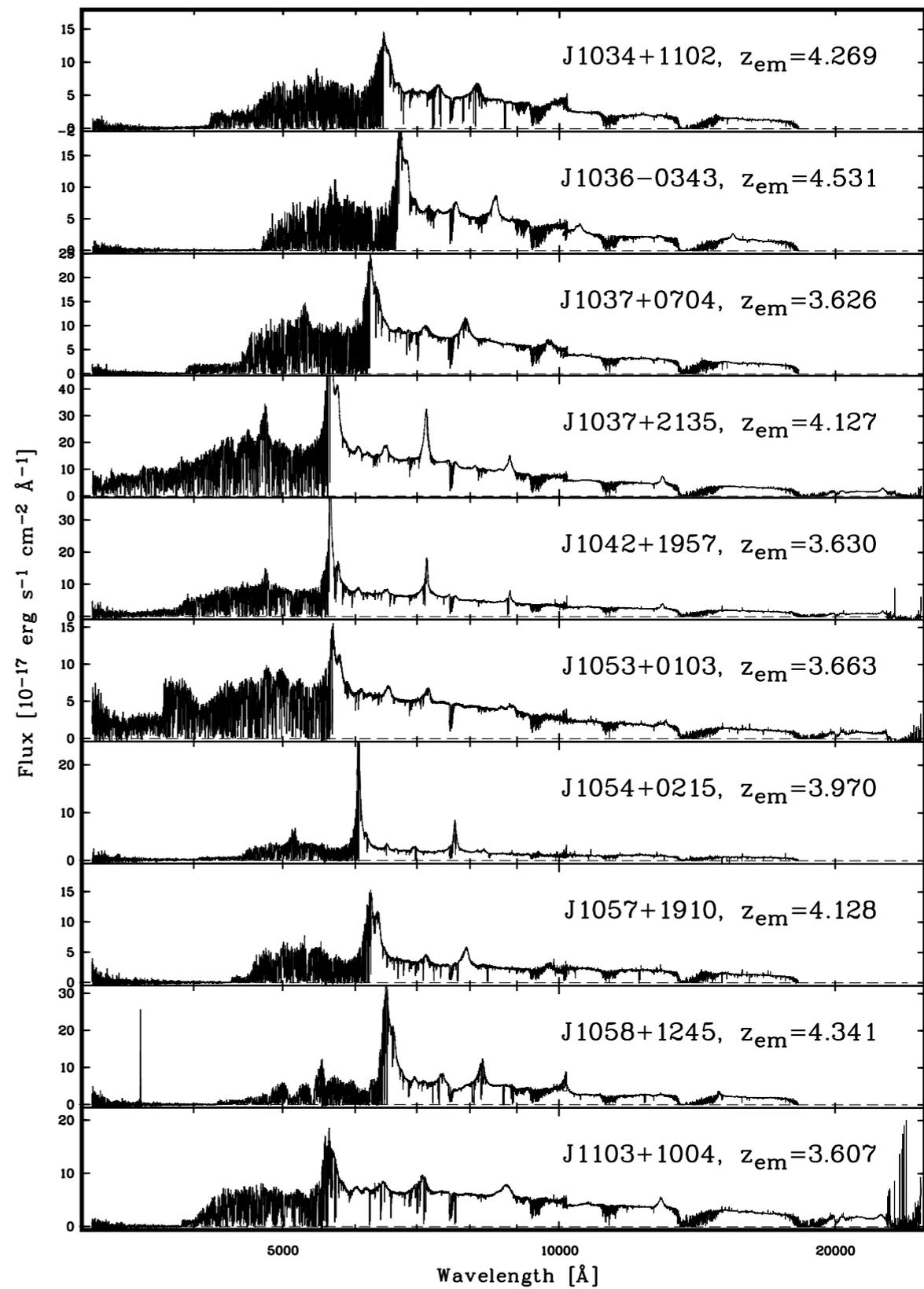
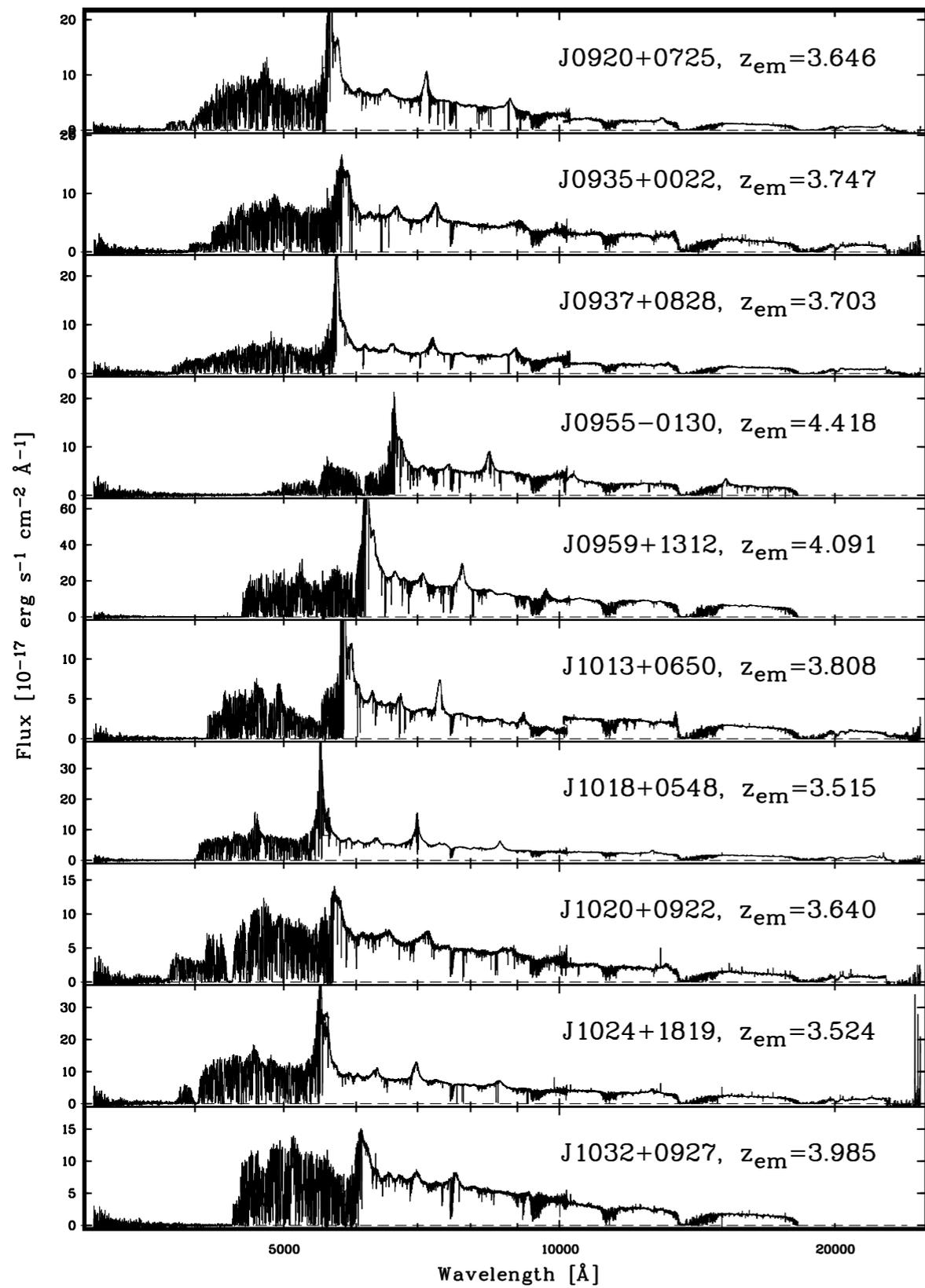
✓ Scalable

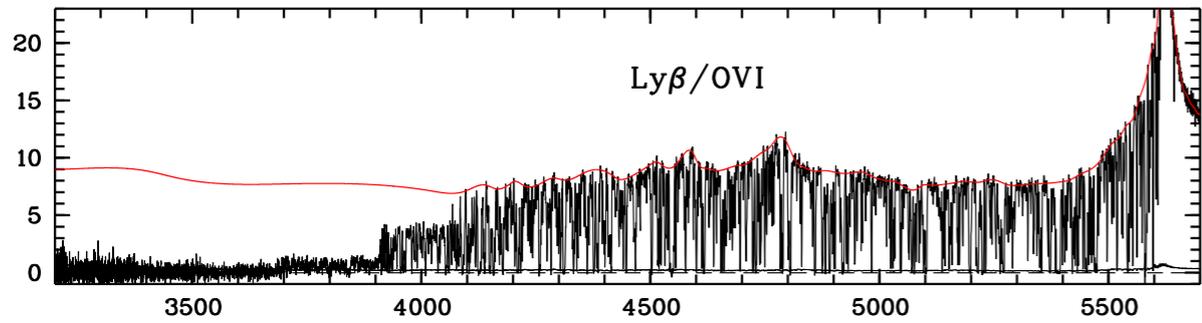
✓ Reproducible

XQ-100: A legacy survey of one hundred $3.5 \lesssim z \lesssim 4.5$ quasars observed with VLT/X-shooter^{★,★★}

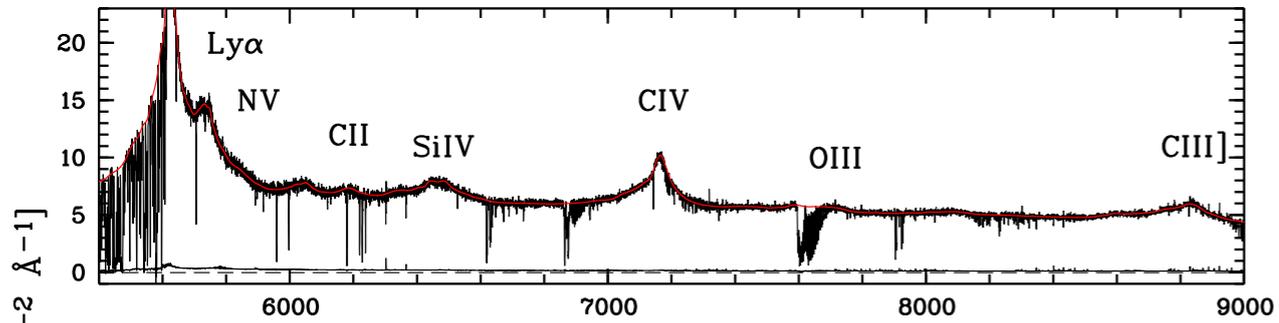
S. López¹, V. D’Odorico², S. L. Ellison³, G. D. Becker^{4,10}, L. Christensen⁵, G. Cupani², K. D. Denney⁶, I. Pâris²,
G. Worseck⁷, T. A. M. Berg³, S. Cristiani^{2,8}, M. Dessauges-Zavadsky⁹, M. Haehnelt¹⁰, F. Hamann¹¹, J. Hennawi⁷,
V. Iršič¹², T.-S. Kim², P. López¹, R. Lund Saust⁵, B. Ménard^{13,★★★}, S. Perrotta^{14,2}, J. X. Prochaska¹⁵,
R. Sánchez-Ramírez^{16,17,18}, M. Vestergaard^{5,19}, M. Viel^{2,8}, and L. Wisotzki²⁰



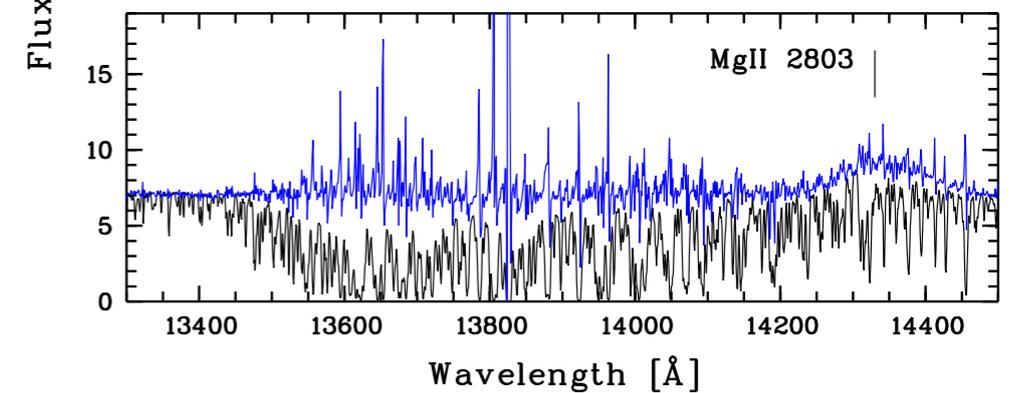
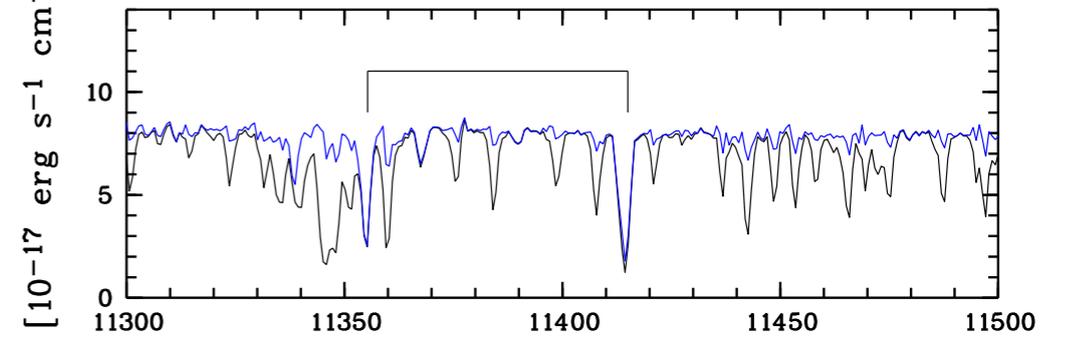
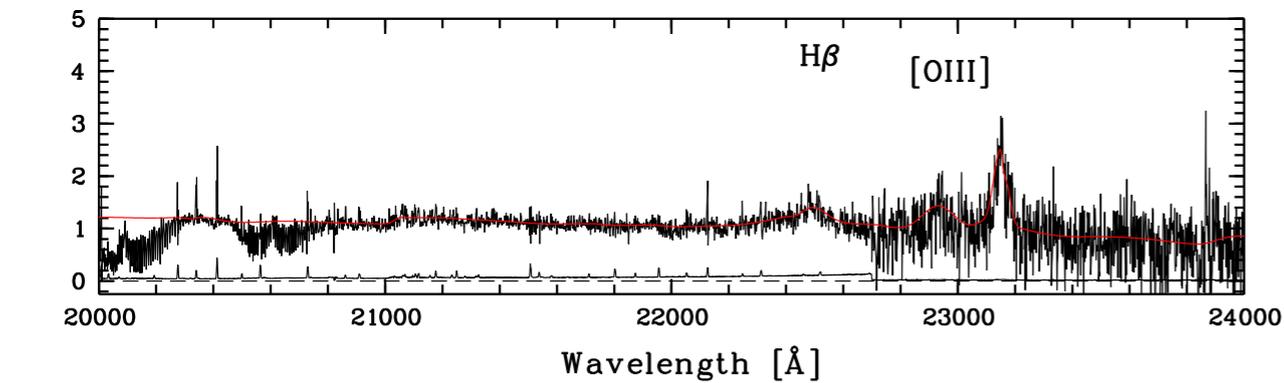
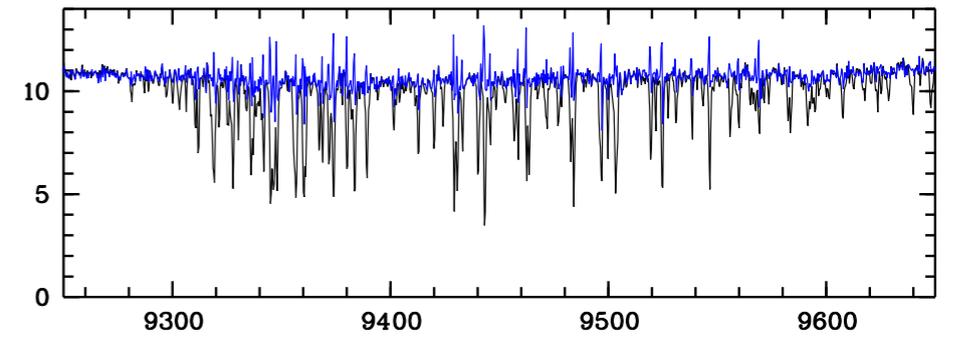
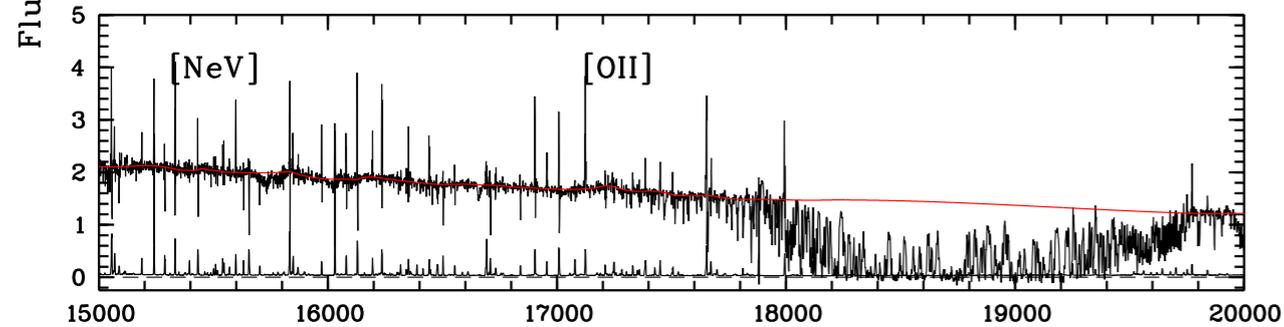
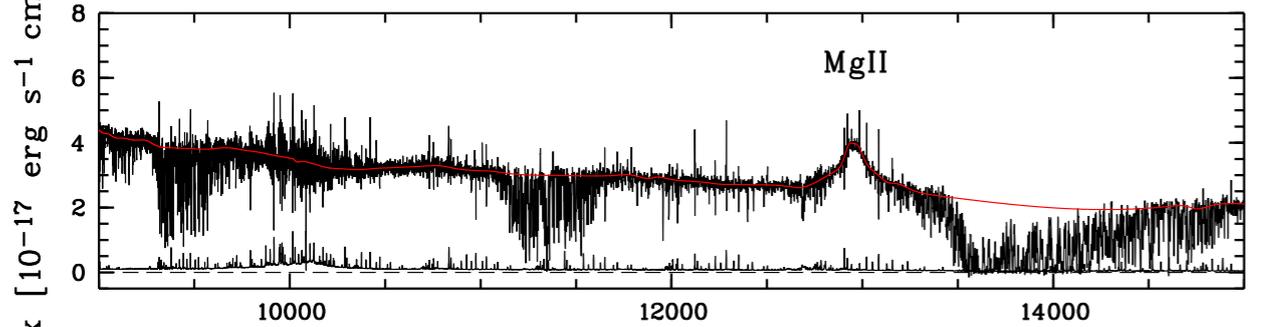




← Redshift+continuum



Telluric correction



XQ-100

The screenshot shows the ESO Catalogue Facility web interface. The browser address bar displays `www.eso.org/qj/catalogQuery/index/73`. The page header features the ESO logo and the tagline "ESO — Reaching New Heights in Astronomy" with a row of international flags. A navigation bar includes links for "Public", "Science", "User Portal", "Intranet", "Contact", "Site Map", and a search box. Below the navigation bar, a breadcrumb trail reads "Science Users Information > ESO Science Archive Facility > ESO Data > ESO Catalogue Facility".

The main content area is titled "Quasars and their absorption lines: a legacy survey of the high-redshift universe (XQ-100), Version 1 (Details)". It contains a "Search by position" section with two tabs: "Single Target" (selected) and "List of Targets". The "Single Target" section includes a "Target:" input field with a "J2000" dropdown, a "Size:" input field set to "2" with a "degree" dropdown, and radio buttons for "Cone" (selected) and "Box". Below these are "Search & View" and "Search & Download" buttons, with the latter including a "FITS" dropdown and the text "in format".

A "Constraints per column" section is also present, containing a table with the following data:

Sort	Column	Constraint	Unit	Description	UCD
▲ ▼	OBJECT	<input type="text"/>		Target designation	meta.id;meta.main
	RA_J2000	<input type="text"/>	deg	[deg] Spectroscopic target pos. (J2000.0)	pos.eq.ra;meta.main
	DEC_J2000	<input type="text"/>	deg	[deg] Spectroscopic target pos. (J2000.0)	pos.eq.dec;meta.main
	Z_QSO	<input type="text"/>		Quasar emission redshift	src.redshift
	N_OBS	<input type="text"/>		Number of observing epochs	meta.code;obs.exposure
	MJD_OBS	<input type="text"/>	d	[d] Start of observations	time.start;meta.main

XQ-100

The screenshot shows the ESO Catalogue Facility interface. The top navigation bar includes 'Public', 'Science', 'User Portal', 'Intranet', 'Contact', 'Site Map', and a search box. The main content area displays the title 'Quasars and their absorption lines: a legacy survey of the high-redshift universe (XQ-100), Release 1 (Details)'. Below this, a 'Query constraints' box shows: RA (J2000) 0.7 (00 03), Dec (J2000) -26.1 (-26 03), and Cone size 2 degree. The 'Query Results' section shows 1 record found, with a download button and a table of results. The table has columns: OBJECT, RA_J2000, DEC_J2000, JOHNSON_MAG_V, Z_QSO, N_OBS, MJD_OBS, MJD_END, RED_QUAL, SNR_170, SNR_300, SNR_360. The single result row shows: HB89 0000-263, 0.84499, -26.05540, 17.5300, 4.12544, 1, 56219, 56219, 0, 78.5073, 99.2020, 0.000000.

European Southern Observatory
ESO — Reaching New Heights in Astronomy

Public Science User Portal Intranet Contact Site Map Search Go!

Science Users Information > ESO Science Archive Facility > ESO Data > ESO Catalogue Facility Guido Cupani Logout

ESO Data

- Raw Data Query Form
- Reduced Data Query Form
- Instrument Specific Query Forms
- PI Packages
- Observation Schedule
- Ambient Conditions Database
- User Publications
- Data Direct Retrieval
- Data Products
- Data Packages
- ESO Catalogue Facility
- User Help

Quasars and their absorption lines: a legacy survey of the high-redshift universe (XQ-100), Release 1 (Details)

Query constraints

RA (J2000) 0.7 (00 03)
Dec (J2000) -26.1 (-26 03)
Cone size 2 degree

[New Query](#) [Modify Query](#)

Query Results

1 records found (out of 100) [Download](#) in [FITS](#) Format Only selected columns

Elapsed time: 2.114 s

Results 1-1 of 1 Show 10 results per page

Text boxes under columns select matching rows [Apply Filter](#) [Clear Filter](#)

OBJECT	RA_J2000	DEC_J2000	JOHNSON_MAG_V	Z_QSO	N_OBS	MJD_OBS	MJD_END	RED_QUAL	SNR_170	SNR_300	SNR_360	◀	▶
String	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number		
HB89 0000-263	0.84499	-26.05540	17.5300	4.12544	1	56219	56219	0	78.5073	99.2020	0.000000		

Results 1-1 of 1 Show 10 results per page

Columns (Drag and drop the red bar or single click on a column for selection) [Reset column order](#)

Name	Unit	Datatype	Description
------	------	----------	-------------

XQ-100

✓ Homogeneous

✗ Rigid

✓ Reusable

✗ Proprietary code

✓ High-level

✗ Reduction only

✓ Wide-scope

✗ Awkward formats

The screenshot shows the ESO Catalogue Facility interface. The top navigation bar includes the ESO logo, the text 'European Southern Observatory', and the slogan 'ESO — Reaching New Heights in Astronomy'. Below this is a search bar and navigation links like 'Public', 'Science', 'User Forum', 'Contact', 'Site Map', and 'Search'. The main content area displays the title 'Quasars and their absorption lines: a legacy survey of the high-redshift universe (XQ-100), Class 1 (Details)'. A 'Query constraints' section shows parameters: RA (J2000) 0.7 (00 03), Dec (J2000) -26.1 (26 03), and Gal. lat. 2.0 (00 00). Below this are 'New Query' and 'Modify Query' buttons. The results section shows '1 records found (out of 100)' and a 'Download' button. A table of results is displayed with columns: OBJECT, RA_J2000, DEC_J2000, JOHNSON_MAG_V, Z_QSO, N_OBS, MJD_OBS, MJD_END, RED_QUAL, SNR_170, SNR_300, SNR_360. The single result row is: HB89 0000-263, 0.84499, -26.05540, 17.5300, 4.12544, 1, 56219, 56219, 0, 78.5073, 99.2020, 0.000000. The page also shows 'Elapsed time: 2.114 s' and 'Results 1-1 of 1'.

OBJECT	RA_J2000	DEC_J2000	JOHNSON_MAG_V	Z_QSO	N_OBS	MJD_OBS	MJD_END	RED_QUAL	SNR_170	SNR_300	SNR_360
HB89 0000-263	0.84499	-26.05540	17.5300	4.12544	1	56219	56219	0	78.5073	99.2020	0.000000

VLT-ESPRESSO DAS

QuickTime Player File Modifica Vista Finestra Aluto

espda_test

ESPRESSO DAS WORKFLOW – Quasar Branch (v. 0.9.6)

Search Components

Advanced ... Sources Cancel

All Ontologies and Folders

- Components
- Projects
- Statistics
- Demos
- Actors
- Dataturbine
- Directors
- Esoreflex
- Job
- Opendap
- Outreach
- R

0 results found.

DIRECTORIES

Input directories:

- ROOT_DATA_DIR: /Users/guido/Work/sandbox/data_wkf
- RAW_DATA_DIR: \$ROOT_DATA_DIR/reflex_input/espda
- CALIB_DATA_DIR: /Users/guido/Work/esopipe/install/calib/espda-0.9.6

Working Directories:

- BOOKKEEPING_DIR: \$ROOT_DATA_DIR/reflex_book_keeping/espda
- LOGS_DIR: \$ROOT_DATA_DIR/reflex_logs/espda
- TMP_PRODUCTS_DIR: \$ROOT_DATA_DIR/reflex_tmp_products/espda
- BOOKKEEPING_DB: \$BOOKKEEPING_DIR/bookkeeping.db

Output directories:

- END_PRODUCTS_DIR: \$ROOT_DATA_DIR/reflex_end_products/espda/

PARAMETERS

NE: Parameters in yellow boxes are temporary.

General parameters:

- RecipeFailureMode: Ask In case of recipe failure: 'Continue', 'Stop', 'Ask'
- EraseDirs: false Erase working directories: 'true' or 'false'
- FITS_VIEWER: fv Fits viewer used for inspection: 'fv'
- ProductExplorerMode: Triggered Show Product Explorer window: 'Triggered'
- SelectDatasetMethod: Interactive Dataset selection: 'All', 'New', 'Reduced', 'Failed', 'Interactive'

Auxiliary parameters (do not change):

- GLOBAL_TIMESTAMP: 2017-09-08T17:31:17
- END_PRODUCTS_SUBDIR: HE0940-1050_UVES_HR_2012-04-01T01:14.03_564_WAVEL/2017-0...
- ESOREX_ARGS: --suppress-prefix=TRUE
- N_SELECTED_DATASETS: 1
- N_SELECTED_SYSTEMS: 1
- CURRENT_LINE: 1

Instrument Parameters:

- INSTR: UVES Instrument (UVES/XSH/HARPS)
- WAVEL_MIN: 480 Minimum wavelength
- WAVEL_MAX: 600 Maximum wavelength

Resolution Parameters:

- VEL_STEP_UVES: 3.0
- RESOL_UVES: 45000
- VEL_STEP_XSH: 1.6
- RESOL_XSH: 6200
- VEL_STEP_HARPS: 1.0
- RESOL_HARPS: 115000
- GLOB_VEL_STEP: 3.0
- GLOB_RESOL: 45000
- LINE_VEL_STEP: 10

CASCADE

Data Organisation and Selection

DDF Director

Notice:
The general concepts of Reflex are described in A&A 559, A96. Please credit this article if you use Reflex for your research. Workflow tutorial, demo data, and user manuals are available on http://www.eso.org/sci/software/pipelines/#reflex_workflows.

Instructions:

- Turn on highlighting: 'Tools' > 'Animate at Runtime...', set to '1'
- Edit ROOT_DATA_DIR to point to your data (subdirs will be searched)
- Edit END_PRODUCTS_DIR to your preferred location (N.B.: must not be a subdir of ROOT_DATA_DIR)
- Run the workflow: ▶ or ctrl-R
- Monitor the progress: 'Window' > 'Runtime Window -'

execution finished: 141649 ms. Memory: 550400K Free: 235759K (43%)

VLT-ESPRESSO DAS

espda_qso_wkf_1_wip (on bigbeauty)

File Edit View Workflow Tools Window Help

Components Data Outline .espda_qso_wkf_1_wip Coadd Spectrum X Mask Spectrum X Detect lines X Fit continuum X Identify systems X Choose Datasets X

ESPRESSO DAS WORKFLOW - Quasar system identification (v. 1.0.2)

Basic setup:

- ROOT_DATA_DIR: /data/espesso/cupani/demo Root directory
- RAW_DATA_DIR: \$ROOT_DATA_DIR/reflex_input/espda/qso_spectra/ Source data directory
- END_PRODUCTS_DIR: \$ROOT_DATA_DIR/reflex_end_products/espda/ End products directory
- MODE: HR Mode (H)
- WAVEL_MIN: 380 Minimum wavelength
- WAVEL_MAX: 780 Maximum wavelength

Advanced setup:

- CALIB_DATA_DIR: /data/espesso/NT/install/calib/espda-1.0.2 Calibration directory
- BOOKKEEPING_DIR: \$ROOT_DATA_DIR/reflex_book_keeping/espda Bookkeeping directory
- LOGS_DIR: \$ROOT_DATA_DIR/reflex_logs/espda Logs directory
- TMP_PRODUCTS_DIR: \$ROOT_DATA_DIR/reflex_tmp_products/espda Temporary products directory
- BOOKKEEPING_DB: \$BOOKKEEPING_DIR/bookkeeping.db Bookkeeping database

case of recipe failure: 'Continue', 'Stop', 'Ask'
 case working directories: 'true' or 'false'
 how Product Explorer window: 'Triggered'
 dataset selection: 'All/New', 'Reduced', 'Failed', 'Interactive'

Select Datasets (on bigbeauty)

Selected	Data Set	Reduced	Descriptions	OBS.TARG.NAME	PRO.CATG	EXPT
<input type="checkbox"/>	QSO_0517-4410_S2D_SKYSUB_A_nov_04T07:00	OK	-	HE 0515-4414	S2D_SKYSUB_A	3600
<input checked="" type="checkbox"/>	QSO_2217-2818_S2D_SKYSUB_A_03T00:12	OK	-	QSO J2220-2803	S2D_SKYSUB_A	3600

Save all Inspect highlighted Select complete Deselect all Filter: New ...

Add description to the current execution of the workflow:

Continue Stop

Data Organisation

```

      graph LR
      subgraph Data_Organisation
      direction LR
      Init[Initialize] --> Coadd[Coadd Spectrum]
      Coadd --> Mask[Mask Spectrum]
      Mask --> Detect[Detect Lines]
      Detect --> Fit[Fit Continuum]
      Fit --> Identify[Identify Systems]
      Identify --> Close[Close Systems]
      Close --> Product[Product Explorer]
      end
      subgraph Data_Storage
      direction LR
      Product --- Storage[Data Storage]
      end
      
```

Auxiliary parameters (do not change):

● GLOBAL_TIMESTAMP: 2019-06-07T15:00:02 ● END_PRODUCTS_SUBDIR: QSO-j1103-2645_S2D_SKYSUB_A_2019-04-26T23:37:41.83Z ● PREFIX: espda ● PREFIX=TRUE ● N_SELECTED_DATASETS: 1 ● N_SELECTED_SYSTEMS: 1 ● CURRENT_LINE: 1

executing.

VLT-ESPRESSO DAS

ESPRESSO DAS WORKFLOW - Quasar system identification (v. 1.0.2)

Basic setup:

- ROOT_DATA
- RAW_DATA
- END_PRODUC
- MODE: HR
- WAVEL_MIN:
- WAVEL_MAX:

Continuum

Flux density [erg cm² s⁻¹ nm⁻¹]

Wavelength [nm]

Continuum (Zoomed)

Flux density [erg cm² s⁻¹ nm⁻¹]

Wavelength [nm]

Legend:

- RSPEC_CONT, flux
- RSPEC_CONT, flux cont.
- +++ FLINE_REM, flux
- SPLINE_CONT, flux

norm.
 error
 fit/resid.

Recipe Parameters

Line parameters: **Fitting**

hwidth: 0.05

par-range: 1.0e-5, 10.0, 16.0, 2.0, 50.0

spline-knots:

Buttons: Continue Wkf, Re-run Recipe, Help

Disable this window in subsequent runs

Use the parameters above as initial values in subsequent executions of this recipe

This data belongs to dataset: QSO_2217-2818_S2D_SKYSUB_A_03T00:12

Data Storage

Close Systems, Product Explorer

Auxiliary parameters (do not change):

- GLOBAL_TIMESTAMP: 2019-06-07T15:00:02
- END_PRODUCTS_SUBDIR: QSO_j1103-2645_S2D_SKYSUB_A_2019-04-26T23:37:41.83Z
- PREFIX: true
- N_SELECTED_DATASETS: 1
- N_SELECTED_SYSTEMS: 1
- CURRENT_LINE: 1

executing.

VLT-ESPRESSO DAS

espda_qso_wkf_2_wip (on bigbeauty)

File Edit View Workflow Tools Window Help

Components Data Outline .espda_qso_wkf_2_wip Fit lines X Fit continuum X Identify systems X

ESPRESSO DAS WORKFLOW - Quasar system fitting (v. 1.0.2)

Basic setup:

- ROOT_DATA_DIR: /data/espesso/cupan/demo Root directory
- RAW_DATA_DIR: \$ROOT_DATA_DIR/reflex_input/espda/qso_systems/QSO_2217-2818 Source data directory
- END_PRODUCTS_DIR: \$ROOT_DATA_DIR/...
- MODE: HR

Advanced setup:

- CALIB_DATA_DIR: /data/espesso/RT/install/calib/espda-1.0.2 Calibration directory
- BOOKKEEPING_DIR: \$ROOT_DATA_DIR/reflex_book_keeping/espda Bookkeeping directory
- LOGS_DIR: \$ROOT_DATA_DIR/reflex_logs/espda Logs directory
- TMP_PRODUCTS_DIR: \$ROOT_DATA_DIR/reflex_tmp_products/espda Temporary products directory
- BOOKKEEPING_DB: \$BOOKKEEPING_DIR/bookkeeping.db Bookkeeping database

Select Datasets (on bigbeauty)

Selected	Data Set	Reduced	Descriptions	OBS.TARG.NAME	PRO.CATG	QC.SYSTID	DAS.SYST
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN	OK	-	UNDEFINED	SLNE_IDEN f		1.2002535793
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_1	OK	-	UNDEFINED	SLNE_IDEN c		0.9407865902
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_2	OK	-	UNDEFINED	SLNE_IDEN k		1.9642317274
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_3	OK	-	UNDEFINED	SLNE_IDEN m		2.1807579835
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_4	OK	-	UNDEFINED	SLNE_IDEN e		1.0827732844
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_5	Failed	-	UNDEFINED	SLNE_IDEN i		1.6277087435
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_6	OK	-	UNDEFINED	SLNE_IDEN l		1.9656887185
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_7	OK	-	UNDEFINED	SLNE_IDEN n		1.9842561595
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_8	OK	-	UNDEFINED	SLNE_IDEN o		2.1807631844
<input checked="" type="checkbox"/>	QSO_2217-2818_SLNE_IDEN_9	OK	-	UNDEFINED	SLNE_IDEN h		1.2002625993

Save all Inspect highlighted Select complete Deselect all Filter: New

Add description to the current execution of the workflow: Continue Stop

Data Organisation

Initialize

Processing

Identify systems

Data Storage

Close Systems

Product Explorer

Auxiliary parameters (do not change):

- GLOBAL_TIMESTAMP: 2019-06-07T15:11:36
- END_PRODUCTS_SUBDIR: QSO_2217-2818_SLNE_IDEN_9/2019-06-07T15:07:03
- ESORexArgs: --suppress-prefix=TRUE
- N_SELECTED_DATASETS: 9
- N_SELECTED_SYSTEMS: 1
- CURRENT_LINE: 8

executing.

VLT-ESPRESSO DAS

The screenshot displays the VLT-ESPRESSO DAS software interface, which is used for processing and analyzing astronomical spectra. The main window, titled "Reflex Interactive App (on bigbeauty)", shows the results of a spectral analysis for a dataset identified as "QSO_2217-2818_SLINE_IDEN_9".

The interface is divided into several panels:

- Left Panel:** Contains a search bar and a tree view of "All Ontologies and Folders", including Components, Disciplines, Projects, Demos, Actors, DataTurbine, Directors, Esoreflex, Job, Opendap, Outreach, and R.
- Top Left Panel:** Shows "Basic setup:" with options for ROOT_DATA, RAW_DATA, and END_PROD, and a MODE set to HR.
- Main Plot Area:** Displays "Identified systems (1)" with three vertically stacked plots:
 - The top plot shows "Normalized flux" vs "Wavelength [nm]" from 400 to 750 nm. It features two data series: "RSPEC_VOIGT, flux" (blue line) and "SLINE_VOIGT, flux" (green line). A legend indicates "selected" lines with green arrows.
 - The middle plot shows the "MgII_2796" line profile, plotting flux against velocity difference.
 - The bottom plot shows the "MgII_2803" line profile, also plotting flux against velocity difference.
- Right Panel:** Contains "Recipe Parameters" for "Line parameters" and "Fitting". Parameters include:
 - hwidth: 0.1
 - par-range: 1e-4,10,0.22,0.2,0.100,0.0,0.0
 - edit-file: (empty)
 Below the parameters are buttons for "Continue Wkf", "Re-run Recipe", and "Help". There are also checkboxes for "Disable this window in subsequent runs" and "Use the parameters above as initial values in subsequent executions of this recipe".
- Bottom Left Panel:** A "Transitions (on bigbeauty)" table listing various spectral lines with their rest-frame and redshifted wavelengths and oscillation strengths.
- Bottom Right Panel:** A "Lines (on bigbeauty)" table providing detailed parameters for the identified lines, including line ID, wavelength, redshift, error, constraints, column density, thermal broadening, and turbulence.
- Bottom Center:** A diagram showing the data flow between "Close Systems" and "Data Storage" components, with "ProductExplorer" also connected to the data storage.

Transitions (on bigbeauty)

Line ID	Rest-frame	Redshifted	Osc. strength
<input type="checkbox"/> NIII_1741	174.15531	383.187250...	0.0427
<input type="checkbox"/> NIII_1751	175.19157	385.46729364	0.0277
<input type="checkbox"/> SiII_1808	180.80129	397.810145...	0.00208
<input type="checkbox"/> MgI_1827	182.79351	402.193550...	0.0242
<input type="checkbox"/> SiI_1845	184.55205	406.06279885	0.27
<input type="checkbox"/> FeI_1851	185.16902	407.420294...	0.02222
<input type="checkbox"/> AlIII_1854	185.47184	408.086577...	0.559
<input type="checkbox"/> AlIII_1862	186.2791	409.86276074	0.278
<input type="checkbox"/> CoII_1941	194.12852	427.133538...	0.034
<input type="checkbox"/> CoII_2012	201.21664	442.729257...	0.0368

Lines (on bigbeauty)

#	Line ID	Wavel.	Redshift	error	constr.	Col. d.	error	constr.	Therm. br.	error	constr.	Turb. br.	error	constr.
<input checked="" type="checkbox"/> 1	MgII_2796	615.2422	1.200158	0.000000	MgII-z-000	11.9060	0.0137	MgII-N-000	2.0713	0.0925	MgII-b-000	0.0000	0.0000	F
<input checked="" type="checkbox"/> 2	MgII_2796	615.2749	1.200275	0.000001	MgII-z-001	11.6842	0.0214	MgII-N-001	2.6135	0.1829	MgII-b-001	0.0000	0.0000	F
<input checked="" type="checkbox"/> 3	MgII_2796	615.2963	1.200352	0.000001	MgII-z-002	11.9109	0.0159	MgII-N-002	3.9908	0.1883	MgII-b-002	0.0000	0.0000	F
<input checked="" type="checkbox"/> 4	MgII_2803	616.8213	1.200158	0.000000	MgII-z-000	11.9060	0.0137	MgII-N-000	2.0713	0.0925	MgII-b-000	0.0000	0.0000	F
<input checked="" type="checkbox"/> 5	MgII_2803	616.8540	1.200275	0.000001	MgII-z-001	11.6842	0.0214	MgII-N-001	2.6135	0.1829	MgII-b-001	0.0000	0.0000	F
<input checked="" type="checkbox"/> 6	MgII_2803	616.8755	1.200352	0.000001	MgII-z-002	11.9109	0.0159	MgII-N-002	3.9908	0.1883	MgII-b-002	0.0000	0.0000	F

VLT-ESPRESSO DAS

The screenshot displays the VLT-ESPRESSO DAS software interface. It features several windows: a main data analysis window with spectral plots, a 'Transitions' table, a 'Lines' table, and a workflow diagram. The interface is overlaid with a list of characteristics.

- ✓ Interactive
- ✓ Reproducible
- ✓ High-level
- ✓ Tailored
- ✗ Hardly pluggable
- ✗ Fixed workflow
- ✗ Black box
- ✗ Closed

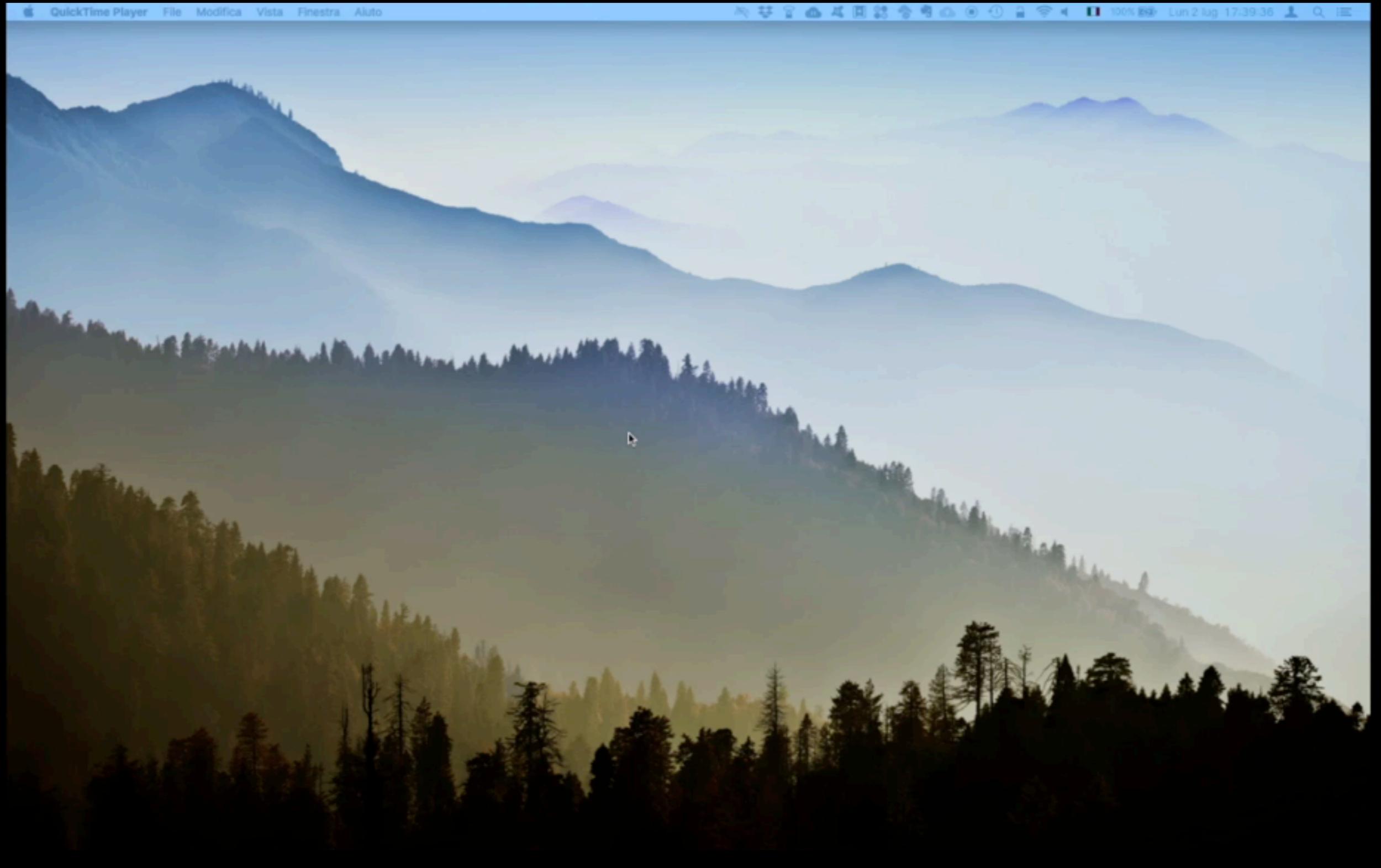
Transitions (on bigbeauty)

Line ID	Rest-frame	Redshifted	Osc. strength
<input type="checkbox"/> NiII_1741	174.15531	383.187250...	0.0427
<input type="checkbox"/> NiII_1751	175.19157	385.46729364	0.0277
<input type="checkbox"/> SiII_1808	180.80129	397.810145...	0.00208
<input type="checkbox"/> MgI_1827	182.79351	402.193550...	0.0242
<input type="checkbox"/> SiI_1845	184.55205	406.06279885	0.27
<input type="checkbox"/> FeI_1851	185.16902	407.420294...	0.02222
<input type="checkbox"/> AlIII_1854	185.47184	408.086577...	0.559
<input type="checkbox"/> AlIII_1862	186.2791	409.86276074	0.278
<input type="checkbox"/> CoII_1941	194.12852	427.133538...	0.034
<input type="checkbox"/> CoII_2012	201.21664	442.779257	0.0168

Lines (on bigbeauty)

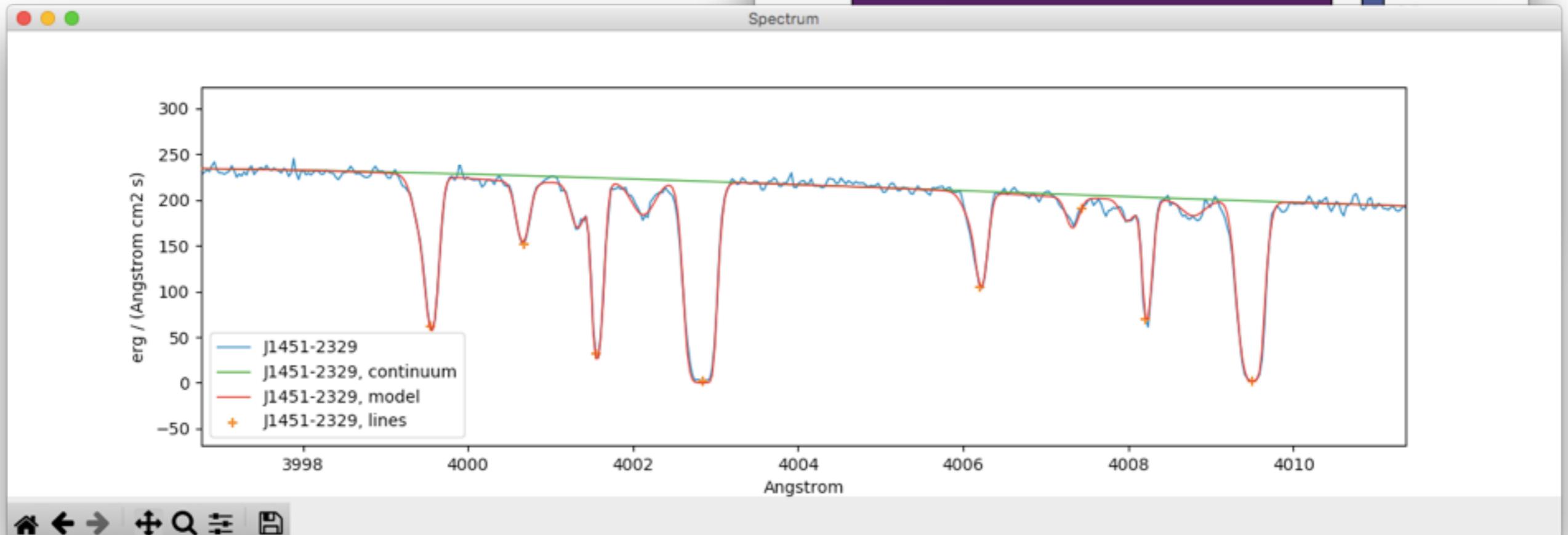
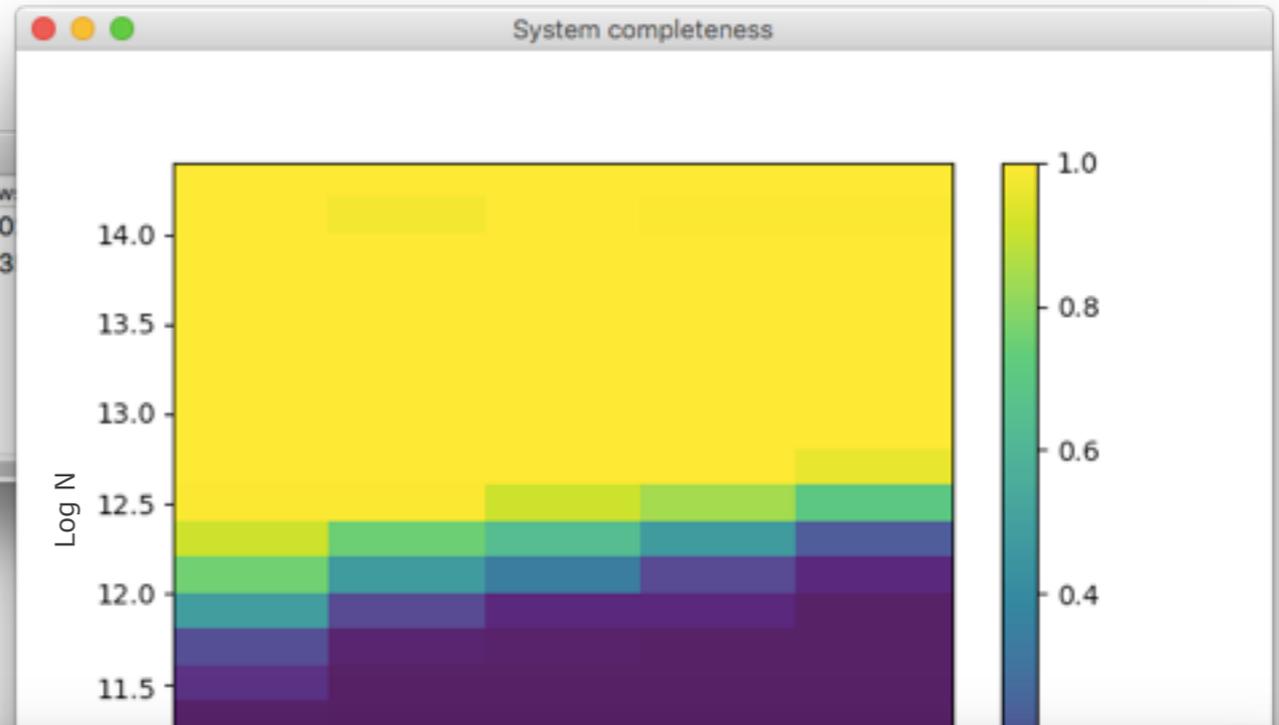
#	Line ID	Wavel.	Redshift	error	constr.	Col. d.	error	constr.	Therm. br.	error	constr.	Turb. br.	error	constr.
<input checked="" type="checkbox"/> 1	MgII_2796	615.2422	1.200158	0.000000	MgII-z-000	11.9060	0.0137	MgII-N-000	2.0713	0.0925	MgII-b-000	0.0000	0.0000	F
<input checked="" type="checkbox"/> 2	MgII_2796	615.2749	1.200275	0.000001	MgII-z-001	11.6842	0.0214	MgII-N-001	2.6135	0.1829	MgII-b-001	0.0000	0.0000	F
<input checked="" type="checkbox"/> 3	MgII_2796	615.2963	1.200352	0.000001	MgII-z-002	11.9109	0.0159	MgII-N-002	3.9908	0.1883	MgII-b-002	0.0000	0.0000	F
<input checked="" type="checkbox"/> 4	MgII_2803	616.8213	1.200158	0.000000	MgII-z-000	11.9060	0.0137	MgII-N-000	2.0713	0.0925	MgII-b-000	0.0000	0.0000	F
<input checked="" type="checkbox"/> 5	MgII_2803	616.8540	1.200275	0.000001	MgII-z-001	11.6842	0.0214	MgII-N-001	2.6135	0.1829	MgII-b-001	0.0000	0.0000	F
<input checked="" type="checkbox"/> 6	MgII_2803	616.8755	1.200352	0.000001	MgII-z-002	11.9109	0.0159	MgII-N-002	3.9908	0.1883	MgII-b-002	0.0000	0.0000	F

ASTROCOOK



ASTROCOOK

Sessions			
name	object	active range	# rows
J1451-2329 (0)	J1451-2329	[3045.00, 5757.03] Angstrom	9040
J1451-2329 (1)	J1451-2329	[3899.88, 4974.90] Angstrom	3583



ASTROCOOK

✓ Python

✓ GUI

✓ Expandable

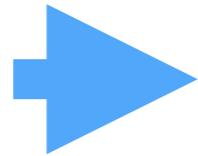
✓ Recipe Model

Sessions			
name	object	active range	# row
J1451-2329 (0)	J1451-2329	[3045.00, 5757.03] Angstrom	9040
J1451-2329 (1)	J1451-2329	[3899.88, 4974.90] Angstrom	3583

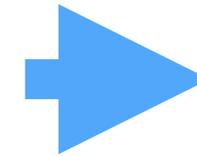


Meta-procedure

Data

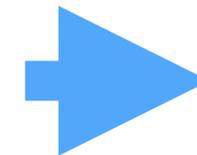
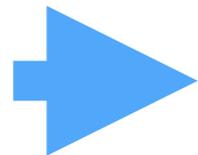


Procedure
[your algorithm
goes here]



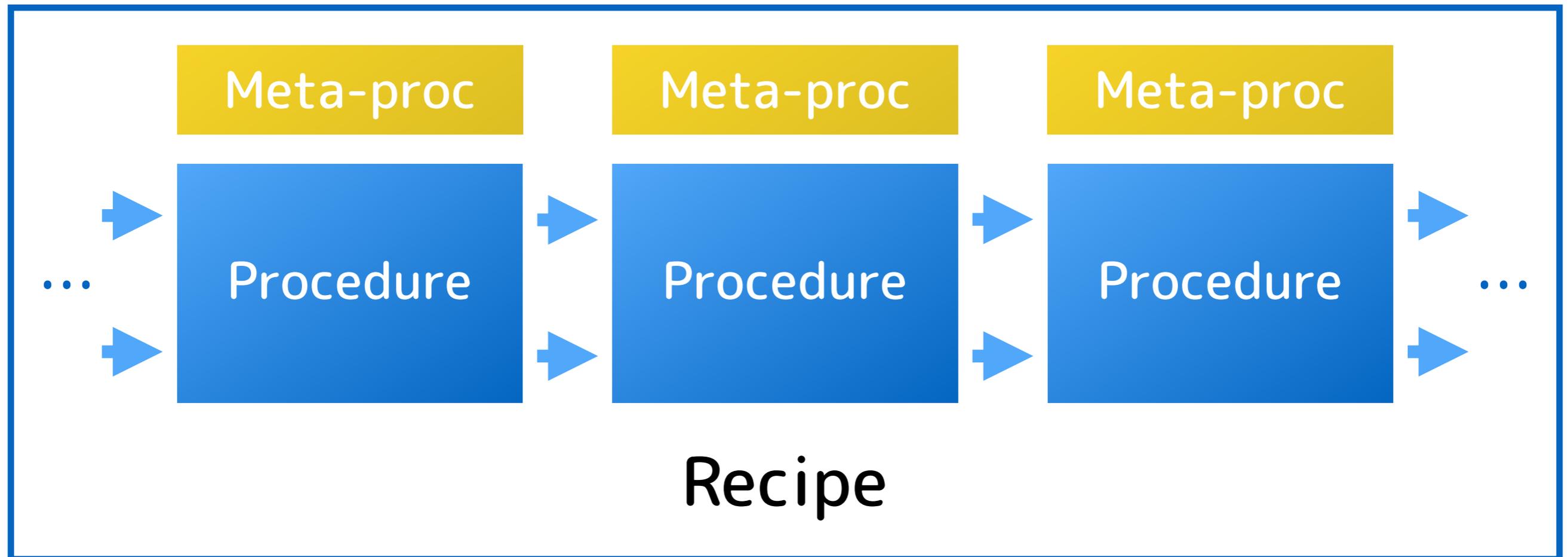
Data

Parameters



Parameters

Meta-recipe



Meta-recipe

Meta-recipe

Meta-recipe

Recipe

Recipe

Recipe

...

Meta-proc

Meta-proc

Meta-proc

Meta-proc

Procedure

Procedure

Procedure

Procedure

...

Self-sustaining ecosystem

Meta-recipe

Meta-recipe

Meta-recipe

Recipe

Recipe

Recipe

...

Meta-proc

Meta-proc

Meta-proc

Meta-proc

Procedure

Procedure

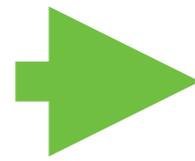
Procedure

Procedure

...

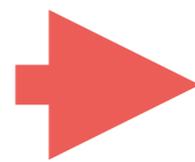
Self-sustaining ecosystem

Narrower
scope



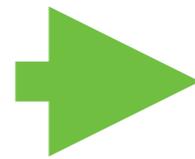
consolidate our resources
in Astrocook

Wider
scope



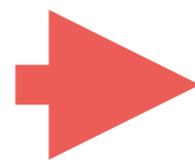
implement a widespread
ecosystem

Narrower
scope



INAF-OATs:   +  
 2-3 years

Wider
scope



Laboratorio:      ...
 long-term (ELT era)