Documentation of MSAP3-32 for PLATO
Selection

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Table 1: Author information

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Table 2: Version history

Issue	Date	№ change description	Page(s)	Paragraph(s)
1.0	March 4, 2023	Initial release	All	All

Contents

1 Introduction

1.1 Scope of the document

This document aims to provide a description of the selection algorithm for the selection and validation module of the MSAP5. It provides technical details (inputs, outputs, data types) as well as the functional description (implementation). The justification for the choice of this specific algorithm and a description of its scientific performances is provided in [please provide the reference of the justification document]. Moreover, the exact position of this algorithm within the data processing pipeline is described in [RD1].

TODO – Andrea, can you help here?

1.2 Nomenclature

See 3 and 4.

Table 3: Nomenclature

Term	Description
M	mass of the star in units of the solar mass $M_\odot$
R	radius of the star in units of the solar radius $R_\odot$
A	age of the star in units of Gyr

Table 4: Standard data types

Type	Size	Values
array	arbitrary	floats

1.3 Referenced documents

MSAP3-31

1.4 Abbreviations

IDP Intermediate Data Product

2 General overview

2.1 Name of the algorithm and status

The algorithm is MSAP5-32, *Selection*. The baseline algorithm has been implemented, but revisions are expected.

2.2 Synopsis

The objective of MSAP5-32 is to select the final values of mass (M), radius (R), and age (A). We implement a priority list, presenting the measurement type of highest priority when it is available, and otherwise moving on to the measurement with the next highest priority. The algorithm outputs which IDP was selected. In the case of no measurements, or an inconsistency flag from MSAP5-31, the algorithm returns 'None'.

2.3 Model

The priority list is as follows:

Mass

1. IDP_MASS_SEISMIC
2. IDP_MASS_GRANULATION
3. IDP_MASS_GRANULATION_CGBM
4. IDP_MASS_RHO_TRANSIT_CGBM

Radius

1. IDP_RADIUS_SEISMIC
2. IDP_RADIUS_GRANULATION_CGBM
3. IDP_RADIUS_RHO_TRANSIT
4. IDP_RADIUS_RHO_TRANSIT_CGBM

Age

1. IDP_AGE_SEISMIC
2. IDP_AGE_GYRO
3. IDP_AGE_ACTIVITY
4. IDP_AGE_GRANULATION_CGBM
5. IDP_AGE_RHO_TRANSIT_CGBM

3 Lists of inputs and outputs

3.1 Complete list of inputs

See documentation for MSAP5-31.

3.2 Complete list of outputs

Table 5: Output parameters

Name	Status	Data type	Dimension	Unit
selected M IDP	mandatory	string	1	N/A
selected R IDP	mandatory	string	1	N/A
selected A IDP	mandatory	string	1	N/A

4 Processing description

4.1 Type of delivery

Prototype

4.2 Algorithm maturity

Algorithm concept defined, but interfaces (inputs/outputs) unstable. Has been tested with randomly-generated pseudo inputs, but needs to be tested with actual inputs from all of the PLATO modules. The complete list of seismic inputs needs to be added.

4.3 Algorithm source

The implemented algorithm and test cases are shipped directly to WP12 office alongside this document as a compressed archive.

4.4 Pseudo-code

N/A

4.5 Flow diagram

N/A

5 Test case(s)

5.1 Implementation test case(s)

The test cases are the same as MSAP5_31. These tests are run in `MSAP5-32-selection.ipynb`.

Case 1

- All consistent measurements.
- Inputs: Defaults
- Outputs: ['IDP_MASS_SEISMIC', 'IDP_RADIUS_SEISMIC', 'IDP_AGE_SEISMIC']

Case 2

- One inconsistent mass measurement. Additionally, in this case, the seismic radius measurement is missing.
- Inputs: Defaults, except 1 is added to all the samples from the first mass method
- Outputs: [None, 'IDP_RADIUS_GRANULATION_CGBM', 'IDP_AGE_SEISMIC']

Case 3

- Two inconsistent radius measurements. Additionally, in this case, the seismic and granulation mass measurements are missing.
- Inputs: Defaults, except 0.5 is added to all the samples from the first radius method, and 1 is added to all the samples from the second radius method
- Outputs: ['IDP_MASS_GRANULATION_CGBM', None, 'IDP_AGE_SEISMIC']

Case 4

- Three inconsistent age measurements.
- Inputs: Defaults, except $2, 4, 6$ are added to the first, second, third age methods
- Outputs: ['IDP_MASS_SEISMIC', 'IDP_RADIUS_SEISMIC', None]

Case 5

- Consistent but invalid measurements.
- Inputs: Defaults, except the radii are 10 solar masses larger
- Outputs: ['IDP_MASS_SEISMIC', 'IDP_RADIUS_SEISMIC', 'IDP_AGE_SEISMIC']

5.2 Scientific test case(s)

Simulated data would be highly valuable in testing the algorithm.