SimuDyna: a package for direct model and inversion of observations with bolometers onboard HFI Planck

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Abstract

This package provides a framework to simulate realistic time response of HFI Planck bolometers to change of incident optical flux or change of

First Basic purpose is to estimate if and when dynamical responses of bolometers will enter in the non-linear range. This is important especially when Jupiter and other planets may cross HFI Planck scans.

Second basic purpose is to estimate if inversion can be done also when we do not access to the data at fastest sampling rate but only after time integration.

Version 2.0 in relation with SimuDyna package Version 0.3 rc 3

1 Introduction

The **SimuDyna** package provides a set of programs in order to be able to do a end to end simulation at time line level and at the bolometers level for HFI Planck.

Please read ASAP the file README.txt.

Documentations and other informations are in `Docs/` A brief summary of functionnalities of programs in `SimuDyna` is done in file `AvailableModules.txt`.

The fastest way to try the package is to run the 4 programs dedicated to tests (`TEST_BASIC, TEST_DEMO, TEST_TIME_CONS, TEST_V_VS_POWER`) and also the program `SIMUL_DIRECT` which computes the response of HFI to Jupiter like sources.

2 Limitations

Nothing about mapping is provided here.

No simple relationship to IMO file is now avaibable.

No simple relationship to SimuCQM/SimulPFM is now available. (This SimuCQM/SimulPFM package is the static instrument simulator).

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3 Parameters

3.1 Bolometers

One part can be found in the IMO file. But two mandatory parameters for standard dynamical models of bolometers are not in the IMO file.

Bolometers parameters are stored in a file `DataBOLOScqm.csv` in path `Data/`. This file is an ASCII file in the CSV format which allows to read and modify it in any spreadsheet sofware (like `oocalc`) but also with any text editor (like `(X)Emacs`).

We provide a functions (`LIST_BOLO_READFILE`) that can read any CSV file and will transform any line containing all mandatory informations into a bolometer structure. Others functions (`LIST_BOLO_EXTRACT, LIST_BOLO_PRINT, LIST_BOLO_SELECT`) give a smart framework in order to easily read the file and select one bolometer in a list.

3.2 Satellite and HFI

Mandatory parameters of the HFI Planck experiment are stored and can be initialized by `PLANCK_INIT_BACKGROUND` and `PLANCK_INIT_FOV`. Differents cases are possibles.

May be this part has to move later to a more conventional way (ASCII files, IMO files).

3.3 The planets and Sources

Up to now, only data for Jupiter are used by the package through `PLANCK_INIT_JUPITER`. This procedure creates a structure `!jupiter_temp`. The prodecure `JUPITER_T2FLUX` converts the temperatures into optical incoming flux, stored in `!jupiter_flux`.

Later the file `DataPLANETS.csv` should be used and sources can be selected (by a way similar to bolo choice).

4 Direct Model and inversion

Direct model and inversion are decribed in another document (`SimuDyna_NL_study.pdf`).

As soon as we have a bolometer structure, it is very easy to call them since we only have to provide incident optical signal for the direct model and the temperature of the bolometer for the inversion, since we assume we know the other parameters, especially bolometer model and bolometer parameters. Default are usually available for others parameters (current, temperature, ...).

Since these two reciprocal modules do not explicitely or implicitely use Planck or Jupiter related information, they can be use without initialisation related to Planck nor Jupiter.

5 Compatibility with GDL

Up to now, GDL[1] cannot be substitute to IDL in order to run this package. Different problems or limitations in GDL (0.8.8 and 0.8.9)

[1] GDL is a GNU/GPL implementation of IDL