
Make It So Documentation

Release 2.1.3

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INTRODUCTION

1.1 Overview

Make It So is a tool that simplifies configuration and execution of numerical models on complex compute environments. It use used to create

- Instructions on how to execute a model
- Shell scripts to run (coupled) model(s)
- Input files for model(s)

1.2 Main Features

- Prompts the user for the minimal set of input parameters to run a model. User input works in several ways:
 - Input from a shell terminal (stdin)
 - From a text configuration file. These configuration files are automatically generated each time makeItSo is run. Look for a file ending with “_makeItSo.config” in your output run directory.
 - Web Interface (Coming soon!)
- Generates model input files for a single model or a collection of coupled models
- Generates shell scripts on a variety of computer systems, taking into account parallel job queues
- Is highly extensible
 - Easily add new models (stand-alone or coupled); see Models/README for details.
 - Easily supports new compute environments & queueing systems; see Environments/README for details.

INSTALLING MAKE IT SO

Add “/path/to/LR/misc/python” to your \$PATH & \$PYTHONPATH:

```
export PATH=/path/to/MakeItSo:$PATH
export PYTHONPATH=/path/to/MakeItSo:$PYTHONPATH
```


USING MAKE IT SO

Obtain a short description and list of options via:

```
makeItSo.py --about  
makeItSo.py --help
```

To configure a model, execute this command & follow the prompts:

```
makeItSo.py
```

When prompted for a variable, pressing <enter> without typing a value in will use the default value. For example, consider the following prompt:

```
Output directory ( . ):  
RUN_IDENTIFIER ( ChangeName ): MyRun
```

Here the user wishes to use the default "." (current directory) for makeItSo output, yet would like to change the RUN_IDENTIFIER from "ChangeName" to "MyRun".

CONFIGURING MAKE IT SO

4.1 Adding a Model

Adding a new model requires four changes to Make It So:

4.1.1 1. Create a YAML file describing the model & its parameters.

At a minimum, the YAML file must contain some metadata and one or more variables/parameters. Below is an example:

```
%YAML 1.1
---
__metadata__:
  model_name: <your_model>
  output_prefix: <inputfile_prefix>
  output_suffix: <inputfile_suffix>

Parameter Type:
- parameter 1:
  description: <text_description>
  status: < enabled | disabled | mandatory > (optional)
  type: < boolean | integer | float | string >
  user_input: < required | optional | expert_only | ignore | shared_model_parameter >
  value: <variable value>
  format_regex: <Regular expression that the value must match.>
  format_human: <human-readable description of format_regex; used to prompt user>
```

See `MakeItSo/Models/LFM.yml` for an example.

New in LTR-2.2.0: “Status” flag can specify whether a variable is enabled, disabled or required. Each model source file (see step 2, below) must decide what to do with this information.

4.1.2 2. Python source code that specifies a class derived from Model.

You must implement the following functions:

- `get_model_setup`
- `get_iteration_setup`
- `get_iteration_teardown`
- `get_run_instructions`

- `get_input_file`
- `set_shared_parameters`
- `set_time_information`

See `MakeItSo/Models/LFM.py`, `MakeItSo/Models/MIX.py`, etc. for examples.

New in LTR-2.2.0: “Status” flag can be used by `get_input_file` in order to generate the proper input file. See `TIEGCM.py` for an example of the “status” flag.

4.1.3 3. Append your new model to `models.yml`.

Coupled models are listed first. Individual models to be coupled are nested. For example, with CMIT, you need Shared, LFM, MIX and TIEGCM:

- CMIT: - Shared - LFM - MIX - TIEGCM

4.1.4 4. Add import statement to `Models/__init__.py`

You need to import your new model into MakeItSo by default. See the file at `MakeItSo/Models/__init__.py` for how some models (ie. the LFM) are imported.

4.2 Adding an Environment

To add scripting/queueing environments, you must define all parameters in a `[QUEUEING-ENVIRONMENT].yml`. The Environment class will locate the YAML file & provide an interface to the user to set up the environment.

We recommend that you start with a pre-existing environment& extend it to your own environment. For example, see `MakeItSo/EnvironmentsLSF.yml` or `MakeItSo/Environments/SGE.yml`.

PROJECT MODULES

5.1 MakeItSo Package

5.1.1 MakeItSo Package

Package that implements makeItSo logic.

5.1.2 Configuration Module

```
class MakeItSo.Configuration.Configuration
```

Bases: object

Configuration Class deals with makeItSo.config files:

1. Write config file out
2. Read config file & instantiate makeItSo objects.

FIXME: Overload `__init__` so it like a function rather than a class e.g. (name, shared, models, env) = Configuration.init(filename)

```
readConfigurationFile (filename)
```

Read coupled model configuration from file and return properly configured script generator objects

Returns: coupled_name: Name of the coupled model (e.g. 'LFM-MIX') shared: Shared Model object
models: A list of Model objects (e.g. [LFM, MIX, XJD] environment: Environment object (e.g. SH, LSF or SGE)

```
writeConfigurationFile (filename, coupled_name, shared, models, environment, includeOptional=False, includeExpert=False)
```

Write the model configuration to a YAML file.

Parameters: filename: File to write coupled_name: Name of the coupled model (e.g. 'LFM-MIX', 'CMIT', etc.) shared: Shared Model object models: list of Model objects (e.g. for LFM-MIX this might be LFM, MIX, XJD) environment: Compute Environment object includeOptional: Should we write out all optional variables? includeExpert: Should we write out all optional variables?

```
class MakeItSo.Configuration.TestConfiguration (methodName='runTest')
```

Bases: unittest.TestCase

```
setUp ()
```

```
tearDown ()
```

```
test_readConfigurationFile ()
```

```
test_write_file_when_parameters_are_changed()
```

5.1.3 Release Module

Release data for the MakeItSo project \$Id: Release.py 1635 2011-05-03 21:13:54Z schmitt \$

5.1.4 core Module

`MakeItSo.core.configure_model` (*coupled_model_name, run_name, output_directory, model, environment, start, stop, iteration*)

Write the model input file and return the set of commands necessary to run a model.

Parameters: `coupled_model_name`: Name of coupled model (e.g. CMIT, LFM-MIX, etc.) `run_name`: Name of the run chosen by the user. `model`: Model object (e.g. LFM, MIX, TIEGCM, etc.) `environment`: Environment object (e.g. SH, SGE, etc.) `start`: start datetime `stop`: stop datetime `iteration`: integer iteration number

Returns: `model_setup_str`: Commands used to prepare the model for execution. `model_exec_commands_str`: Commands used to actually run a model. `model_teardown_str`: Commands used to remove temporary/intermediary files used in a model run.

`MakeItSo.core.generateScripts` (*coupled_model_name, shared_model, models, env, options*)

Generate the set of scripts & input files given the input parameters.

Parameters: `coupled_model_name`: Name of coupled model (e.g. CMIT, LFM-MIX, etc.) `shared_model`: Shared model object `models`: List of Model objects (e.g. LFM, MIX, TIEGCM, etc.) `env`: Environment object (e.g. SH, SGE, etc.) `options`: `makeItSo` `optparse` options

`MakeItSo.core.getInput` (*options*)

Get user input (either stdin or from a config file) necessary to generate scripts.

Parameters: `options`: `makeItSo` `optparse` options

Returns: `coupled_model_name`: Name of coupled model (e.g. CMIT, LFM-MIX, etc.) `shared_model`: Shared model object `models`: List of Model objects (e.g. LFM, MIX, TIEGCM, etc.) `env`: Environment object (e.g. SH, SGE, etc.)

`MakeItSo.core.main` ()

Run `makeItSo`:

`MakeItSo.core.parse_arguments` ()

Returns an `optparse` object of parsed command-line arguments.

`MakeItSo.core.writeSetupFile` (*coupled_model_name, shared_model, models, env*)

Writes a `RUN_IDENTIFIER-setup.sh` script that preconfigures models. Returns run instructions that should be piped to stdout.

`MakeItSo.core.writeSimulationScripts` (*coupled_model_name, shared_model, models, env, spinup_iterations*)

Write the job scripts & input files necessary for the simulation.

Notes:

- Parameters are the same as `generateScripts(...)`
- If any model spinup is required, those scripts should've been written in `writeSpinupScripts(...)`.

`MakeItSo.core.writeSpinupScripts` (*coupled_model_name, shared_model, models, env*)

Create segments for 'spinup' times, if necessary. These scripts initialize the model & its components.

Notes:

- Parameters are the same as generateScripts(...)
- The shared_model parameter 'spinup' determines if any spinup scripts are necessary.

`MakeItSo.core.write_run_script` (*run_name, output_directory, environment, uses_intercomm, setup, commands, teardown, iteration*)

Write coupled model run script to file.

Parameters: run_name: environment: uses_intercomm: setup: commands: teardown: iteration:

Returns: None

5.1.5 share Module

`MakeItSo.share.matches_regex` (*regex, inString*)

Does inString match regex?

'Some people, when confronted with a problem, think *I know! I'll use regular expressions*. Now they have two problems.'

– Jamie Zawinski

`MakeItSo.share.setupOutputDirectory` (*dirpath*)

Check if the directory exists, create it if it doesn't. Print warnings if it's not empty.

Parameters: dirpath: directory that we'll generate input files & scripts in.

`MakeItSo.share.stdin_get_variable` (*variable_name, variable_dict*)

Query the user (via stdin) to enter data for the given variable. Return the value entered by the user.

Parameters: variable_name: variable_dict: Dictionary that should have the following keys:

- description: <text_description>
- type: <boolean | integer | float | string >
- user_input: <required | optional | expert_only | ignore | shared_model_parameter >
- value: <variable value>
- format_regex: <Python 're' module regular expression that value must match.>
- format_human: <human-readable description of what the variable should contain>

Returns: Value entered by user

`MakeItSo.share.stdin_select` (*name, optionList, sorted=True*)

Prompt the user via stdin input to select one item from a list.

Parameters: name: Identify what the list represents optionList: List of options to select from sorted: Should we auto-sort the list alphabetically?

Returns: Integer into original selection list

Example:

```
stdin_select('model', ['CMIT', 'LFM-MIX', 'LFM-RCM', 'LFM', 'TIEGCM']) Available models:
0 CMIT 1 LFM 2 LFM-MIX 3 LFM-RCM 4 TIEGCM Choose a model (0-4) to configure:
```

`MakeItSo.share.unittestAssertBigStrings` (*testObj, s1, s2*)

Perform a line-by-line assertEquals on two LARGE strings for a unit test.

Inputs: testObj: an object of a class derived from unittest.TestCase s1: Big string with line breaks to compare against s2. s2: Big string with line breaks to compare against s1.

`MakeItSo.share.word_wrap (string, width=80, ind1=0, ind2=0, prefix='')`

word wrapping function. string: the string to wrap width: the column number to wrap at prefix: prefix each line with this string (goes before any indentation) ind1: number of characters to indent the first line ind2: number of characters to indent the rest of the lines

Shamelessly taken from <http://www.saltycrane.com/blog/2007/09/python-word-wrap-function/> Could probably adapt from Python's textwrap module <http://docs.python.org/library/textwrap.html>

5.1.6 Subpackages

Environments Package

Environments Package

To add scripting/queueing environments, you must define all parameters in a [QUEUEING-ENVIRONMENT].yml. The Environment class will locate the YAML file & provide an interface to the user to set up the environment.

Environment Module

`class MakeItSo.Environments.Environment.Environment`

Bases: object

Set the job scripting environment

`get_num_cpus (cpuString)`

Return the integer number of processors to use.

FIXME: This currently the 'n_processors' string to determines how many CPU's should be used. In the future, I could add a `__metadata__` flag like 'nCpusPerNode' and use this to determine how many nodes & cpus should be used

`get_pvm_startup ()`

Return a string containing the code necessary to configure & start the PVM daemon.

`get_run_command (is_mpi, executable, flags, stdin, stdout_and_stderr)`

Get the command used to run an executable.

For example usage, see 'test_get_run_instructions'.

Parameters: is_mpi: Boolean to determine whether this particular command needs to be run via MPI.
executable: Name of the executable flags: flags for executable stdin: file to stdin redirect stdout_and_stderr: stdout/stderr redirects.

Returns: string: Complete Unix-style run command.

`get_script_header (run_identifier, iteration, has_InterComm)`

Returns a string containing the header of a job script, including any queueing environment-specific settings.

WARNING: Must input the scripting parameter values first!

`get_sh_script_footer (run_identifier, iteration, has_InterComm)`

Returns a string containing the footer of a job script.

`get_variable_dict (variable_type, variable_name)`

Search the parameters dictionary for `variable_name`, which is of `variable_type`.

This function uses a 'soft copy' of (akin to a C pointer to) the variable, and hence it's the proper way to get and set variables.

selectEnvironment (*selection*)

Select a particular environment & set helper member variables internal to the Environment class.

class MakeItSo.Environments.Environment.**TestEnvironment** (*methodName='runTest'*)

Bases: unittest.TestCase

setUp ()

test_get_num_cpus ()

test_get_num_cpus_TRM ()

Torque Resource Manager (TRM) requires a different format for nCpus: -lnodes=3:ppn:8

This will utilize 3 nodes and 8 CPUs per node, so 24 CPUs total.

test_get_run_command ()

inputs Module

Functions that help get user input to Environment parameters.

MakeItSo.Environments.inputs.**input_parameter_values_from_stdin** (*env, include_optional, include_expert, has_InterComm=True*)

Query the user to select an environment & then enter all required input parameters via stdin input

Parameters: env: Environment object to get/set variables include_optional: When true, query user to input optional variables include_expert: When true, query user to input expert variables has_InterComm: When true, the user needs to input InterComm & PVM variables

MakeItSo.Environments.inputs.**stdin** (*include_optional, include_expert, has_InterComm=True*)

Select a run environment & input its parameters

Parameters: include_optional: When true, query user to input optional variables include_expert: When true, query user to input expert variables has_InterComm: When true, the user needs to input InterComm & PVM variables

Returns: env - Environment object (i.e. SH, SGE, LSF, etc.)

Models Package

Models Package

Coupled and stand-alone models must be defined in 'models.yml'.

To add additional models, you must:

- Define it in 'models.yml'
- Create [MODEL-NAME].yaml defining parameters
- Create [MODEL-NAME].py, including a [MODEL-NAME] class derived from Model. See LFM.py for an example.
- Add import statement to Models/__init__.py

See README for more details.

MakeItSo.Models.**getModelCoupling** ()

Get dictionary of queueing environments

LFM Module

class `MakeItSo.Models.LFM.LFM`

Bases: `MakeItSo.Models.Model.Model`

LFM Model Type

get_input_file ()

Get contents of LFM INPUT1.xml file.

Returns: `str_script`: String of job script

FIXME: If no module variables are added, the XML still gets an empty `<module>...</module>` tag...

Note: Required function (standardized parameters & return variables)

get_iteration_setup (*model_name*, *iteration*)

Setup environment to run a model, ends with newline when not empty

get_iteration_tearardown (*model_name*, *iteration*)

Tearardown environment to run a model, ends with newline when not empty

Note: this is `/bin/sh` specific!

get_model_setup (*model_name*, *has_spinup*, *run_identifier*, *start_datetime*)

get_run_instructions (*model_name*, *iteration*)

Get the executable, inputs & outputs needed to run the model.

For example usage, see `'test_get_run_instructions'`.

Note: Required function (standardized parameters & return variables)

Returns: `boolean`: True when parallel executable: Name of executable to run flags: any command-line arguments `stdin`: where to redirect stdin input from `stdout_and_stderr`: Where to redirect stdout/stderr to?

get_spinup_coupled_model_name (*coupled_model_name*)

set_shared_model_parameters (*run_prefix*, *lfm_mix_exchange_frequency*, *dumpInterval*,
use_intercomm)

Setup internal structure of generic LFM shared parameters

This sets four parameters defined in LFM.yml:

- `HDFBASE_IN`, `HDFBASE_OUT`, `RUN_NAME`: strings used for naming LFM input/output files
- `TIME_DUMP_INTERVAL`: Number of seconds between file dumps
- `USE_INTERCOMM`: do we use InterComm (True) or adhoc (False) coupling?

set_shared_parameters (*coupled_model_name*, *shared_model*, *env=None*)

Note: Required function (standardized parameters & return variables)

set_time_information (*start_datetime*, *stop_datetime*)

Setup the internal structure of the LFM parameters to generate the correct set of scripts.

This function sets two parameters defined in LFM.yml:

- **START_DATETIME**: Whitespace delimited integer array of YYYY MM DD HH MM SS for the first timestep on the current segment.
- **STOP_DATETIME**: Whitespace delimited integer array of YYYY MM DD HH MM SS for the final timestep on the current segment.

start_datetime: datetime object stop_datetime: datetime object

Note: Required function (standardized parameters & return variables)

```
class MakeItSo.Models.LFM.TestLFM(methodName='runTest')
    Bases: unittest.TestCase

    setUp()

    test__resolution_string()

    test_get_iteration_setup()

    test_get_iteration_teardown()

    test_get_model_setup()

    test_get_run_instructions()

    test_get_spinup_coupled_model_name()

    test_set_shared_model_parameters()

    test_set_time_information()
```

MIX Module

```
class MakeItSo.Models.MIX.MIX
    Bases: MakeItSo.Models.Model.Model

    MIX Model Type

    get_input_file()
        Get contents of MIX parameter file

        Returns: str_script: String of job script

        Note: Required function (standardized parameters & return variables)

    get_iteration_setup(model_name, iteration)
        Setup environment to run a model, ends with newline when not empty

    get_iteration_teardown(model_name, iteration)
        Teardown environment to run a model, ends with newline when not empty

    get_model_setup(model_name, has_spinup, run_identifier, start_datetime)

    get_run_instructions(model_name, iteration)
        Get the executable, inputs & outputs needed to run the model.

        For example usage, see 'test_get_run_instructions'.

        Note: Required function (standardized parameters & return variables)

    set_shared_model_parameters(run_prefix,          exchange_frequency,          dump_interval,
                               use_intercomm)
        Setup internal structure of generic MIX shared parameters

        This sets two parameters defined in MIX.yml:

        • OUTPUT_FILE_PREFIX: string to prepend to each MIX output file.

        • FLUSH_FREQUENCY: Number of LFM-MIX exchanges between file dumps (set to match the
          'dumpInterval').

        • USE_INTERCOMM: Is coupling Adhoc or via InterComm?
```

Parameters: `run_prefix`: string to prepend to LFM output files. `exchange_frequency`: Number of seconds between exchanges with LFM `dump_interval`: Number of seconds between file dumps `use_intercomm`: do we use InterComm (True) or adhoc (False) coupling?

set_shared_parameters (*coupled_model_name, shared_model, env=None*)

Note: Required function (standardized parameters & return variables)

set_time_information (*start_datetime, stop_datetime*)

Set start time (i.e. to point to the correct MHD_GRID_FILE_NAME).

This sets one parameters defined in MIX.yml:

- MHD_GRID_FILE_NAME: to something like 'CMIT_mhd_YYYY-MM-DDTHH-MM-SSZ.hdf'

Parameters:

start_datetime: datetime object specifying the starting year-month-day-hour-minute-second for this segment.

stop_datetime: Unused. Stop time determined by LFM kill signal.

Note: Required function (standardized parameters & return variables)

class MakeItSo.Models.MIX.**TestMIX** (*methodName='runTest'*)

Bases: `unittest.TestCase`

setUp ()

test_get_iteration_setup ()

test_get_iteration_teardown ()

test_get_model_setup ()

test_get_run_instructions ()

test_set_shared_model_parameters ()

test_set_shared_parameters ()

test_set_time_information ()

Model Module

Individual model parameters for LFM, MIX, TIEGCM, and any variables shared between the models.

class MakeItSo.Models.Model.**Model** (*filename*)

Bases: `object`

Abstract base class for code models

get_input_file ()

get_iteration_setup (*model_name, iteration*)

get_iteration_teardown (*model_name, iteration*)

get_model_setup (*model_name, has_spinup, run_identifier, start_datetime*)

get_run_instructions (*model_name, iteration*)

get_spinup_coupled_models ()

get_spinup_times (*start*)

Get segments required for model spinup (ending at 'start' datetime).

Parameters: start: datetime used for starting a TIE-GCM run

Returns: spinup_start: list of datetime objects corresponding to start date & time for model spinup segments. spinup_stop: list of datetime objects corresponding to stop date & time for model spinup segments. spinup_dt: List of float objects corresponding to the time dump interval for the spinup

FIXME: There's a peculiar error here: Given certain CMIT inputs:

- START_YMDHMS: 1996 5 19 16 0 0
- STOP_YMDHMS: 1996 5 20 6 0 0
- TIME_DUMP_INTERVAL: 120.0

this function returns a spinup_dt where at least one element of the list are datetime.timedelta objects rather than a floating-point number of seconds. I suspect this happens because it jumps from returning number of seconds to either number of minutes or hours.

get_variable_dict (*variable_type, variable_name*)

Search the parameters dictionary for *variable_name*, which is of *variable_type*.

This function uses a 'soft copy' of (akin to a C pointer to) the variable, and hence it's the proper way to get and set variables.

set_shared_parameters (*shared_model, env=None*)

set_time_information (*start_datetime, stop_datetime*)

NewModelTemplate Module

RCM Module

class MakeItSo.Models.RCM.**RCM**

Bases: `MakeItSo.Models.Model.Model`

RCM Model Type

get_input_file ()

Get contents of [] input parameter file

Returns: str_script: String of job script

Note: Required function (standardized parameters & return variables)

get_iteration_setup (*model_name, iteration*)

Setup environment to run a model, ends with newline when not empty

RCM requires a few files:

- Coupling parameters: rcm_lfm.param
- RCMfiles subdirectory containing:
 - rcm.params namelist
 - enchan.dat (defines constants)
 - dktable (defines constants)

get_iteration_teardown (*model_name, iteration*)

Teardown environment to run a model, ends with newline when not empty

get_model_setup (*model_name, has_spinup, run_identifier, start_datetime*)

get_run_instructions (*model_name, iteration*)

Get the executable, inputs & outputs needed to run the model.

For example usage, see 'test_get_run_instructions'.

Note: Required function (standardized parameters & return variables)

Returns: boolean: True when parallel executable: Name of executable to run flags: any command-line arguments stdin: where to redirect stdin input from stdout_and_stderr: Where to redirect stdout/stderr to?

set_shared_parameters (*coupled_model_name, shared_model, env=None*)

Note: Required function (standardized parameters & return variables)

set_time_information (*start_datetime, stop_datetime*)

Take care of any special behavior for start/stop times for a run.

Parameters:

start_datetime: datetime object specifying the starting year-month-day-hour-minute-second for this segment.

stop_datetime: Unused. Stop time determined by LFM kill signal.

Note: Required function (standardized parameters & return variables)

class MakeItSo.Models.RCM.**TestRCM** (*methodName='runTest'*)

Bases: unittest.TestCase

setUp ()

test_get_iteration_setup ()

test_get_iteration_teardown ()

test_get_model_setup ()

test_get_run_instructions ()

test_set_shared_parameters ()

Shared Module

class MakeItSo.Models.Shared.**Shared**

Bases: MakeItSo.Models.Model.Model

Shared model parameters

get_segment_time_slices ()

Calculate the segment start and stop times via the user input variables defined in Models/Shared.yml

The user should input reasonable values for the following variables before calling this function:

- START_YMDHMS
- STOP_YMDHMS
- TIME_DUMP_INTERVAL
- WALLCOCK_HOURS_PER_SEGMENT
- SIMULATION_HOURS_PER_SEGMENT

Returns:

- `segment_start_times`: array of datetime objects
- `segment_stop_times`: array of datetime objects

`is_Coupled_Via_InterComm` (*coupled_model_name*)

Check if USE_INTERCOMM is enabled if `coupled_model_name` is a coupled model that is capable of utilizing InterComm.

Parameters: `coupled_model_name`: name of coupled model (e.g. LFM-MIX, CMIT, etc.)

class `MakeItSo.Models.Shared.TestShared` (*methodName='runTest'*)

Bases: `unittest.TestCase`

`setUp` ()

`test_get_segment_time_slices` ()

`test_get_segment_time_slices_fast_cpu` ()

`test_get_segment_time_slices_slow_cpu` ()

`test_is_Coupled_Via_InterComm` ()

TIEGCM Module

class `MakeItSo.Models.TIEGCM.TIEGCM`

Bases: `MakeItSo.Models.Model.Model`

TIEGCM Model Type

`get_input_file` ()

Get contents of TIEGCM input namelist

Returns: `str_script`: String of job script

Note: Required function (standardized parameters & return variables)

`get_iteration_setup` (*model_name, iteration*)

Setup environment to run a model, ends with newline when not empty

`get_iteration_teardown` (*model_name, iteration*)

Teardown environment to run a model, ends with newline when not empty

`get_model_setup` (*model_name, has_spinup, run_identifier, start_datetime*)

FIXME: In the future, provide support for 2.5 or 5 degree resolution. FIXME: In the future, allow for MPI or serial tiegcm.

`get_run_instructions` (*model_name, iteration*)

Get the executable, inputs & outputs needed to run the model.

For example usage, see 'test_get_run_instructions'.

Note: Required function (standardized parameters & return variables)

`get_spinup_coupled_model_name` (*coupled_model_name*)

`get_spinup_times` (*start*)

Overloaded `Model::get_spinup_times(...)` that ensures the initial starting time is 00:00:00 for any given Year/Month/Day.

Parameters: `start`: datetime used for starting a TIE-GCM run

Returns: spinup_start: list of datetime objects corresponding to start date & time for model spinup segments. spinup_stop: list of datetime objects corresponding to stop date & time for model spinup segments.

set_shared_model_parameters (*label, dump_interval*)

Setup internal structure of generic TIEGCM shared parameters

This sets some shared parameters defined in TIEGCM.yml:

- LABEL
- HIST: Frequency to save primary history files
- SECHIST: Frequency to save secondary history files

Due to a ‘feature’ (or is it a bug?) with TIEGCM, we must also set the following to match HIST & SECHIST:

- SAVE
- SECSAVE

Function Parameters: label: string dump_interval: floating-point number of seconds between dumps

set_shared_parameters (*coupled_model_name, shared_model, env=None*)

Note: Required function (standardized parameters & return variables)

set_time_information (*start, stop*)

This function sets the following TIEGCM parameters based on function input parameters.

- START_YEAR (4-digit integer)
- START_DAY (day of year)
- SOURCE (Filename: prefix_TIE_YYYY-MM-DDTHH.nc)
- SOURCE_START (DayOfYear,Hour,Minute)
- START (DayOfYear,Hour,Minute)
- STOP (DayOfYear,Hour,Minute)
- OUTPUT: list of silenames ('prefix_TIE_YYYY-MM-DDThh.nc','prefix_TIE_YYYY-MM-DDThh.nc',...)
- MXHIST_PRIM (integer)
- SECSTART (DayOfYear,Hour,Minute)
- SECSTOP (DayOfYear,Hour,Minute)
- SECOUT list of silenames ('prefix_sech_TIE_YYYY-MM-DDThh.nc','prefix_sech_TIE_YYYY-MM-DDThh.nc',...)
- MXHIST_SECH (integer)

Note: This function contains a considerable section of business logic to determine the primary & secondary history file names.

Function input parameters: start: segment start time stop: segment stop time

Note: Required function (standardized parameters & return variables)

class MakeItSo.Models.TIEGCM.**TestTIEGCM** (*methodName='runTest'*)

Bases: unittest.TestCase

```

setUp()
test__get_filename_string()
test__seconds_to_days_hours_minutes()
test_get_input_file()
    Make sure the default input file matches the expected input
test_get_iteration_setup()
test_get_model_setup()
test_get_run_instructions()
test_get_spinup_coupled_model_name()
test_get_spinup_times()
test_set_time_information()
test_shared_model_parameters()

```

XJD Module

```

class MakeItSo.Models.XJD.TestXJD (methodName='runTest')
    Bases: unittest.TestCase

```

```

    setUp()

    test_get_model_setup()

    test_set_shared_parameters()

```

```

class MakeItSo.Models.XJD.XJD
    Bases: MakeItSo.Models.Model.Model

```

InterComm XML Job Description file

Since we only need one or two XJD files for a whole run interval, most functions do nothing.

```

get_input_file()

get_iteration_setup(model_name, iteration)
    Setup environment to run a model, ends with newline when not empty

get_iteration_teardown(model_name, iteration)
    Teardown environment to run a model, ends with newline when not empty

get_model_setup(model_name, has_spinup, run_identifier, start_datetime)

get_run_instructions(model_name, iteration)

get_xjd_file(components)

set_shared_parameters(coupled_model_name, shared_model, env=None)
    Note: Required function (standardized parameters & return variables)

set_time_information(start_datetime, stop_datetime)

write_xjd_file(filename, components)
    Write an XJD file with a particular set of components

    Parameters: filename: write XJD file to here components: list of components usef for coupled models

    Example: write_xjd_file('LFM-MIX-RCM.xjd', ['mhd','cpl','im'])

```

inputs Module

Functions that help get user input to model parameters.

`MakeItSo.Models.inputs.stdin(include_optional=False, include_expert=False)`

Select a model & input its parameters.

Models & their dependencies are defined in ‘models.yml’

Parameters: `include_optional`: Query user to input optional variables? `include_expert`: Query user to input expert_only variables?

Returns: `coupled_model_name` - name of the coupled model to configure. `models` - list of model parameters
`shared_model_index` - integer index into ‘models’ list of shared model parameters

`MakeItSo.Models.inputs.stdin_input_parameters(coupled_model_name, model_object, include_optional=False, include_expert=False)`

Query the user to enter all required input parameters via stdin input. Note the `model_object` is an input & output parameter, since it reads & writes member data.

Parameters:

`coupled_model_name`: Name of the coupled model (CMIT, LFM-MIX, etc.)

`model_object`: An object derived from a subclass of `Model` (e.g. LFM, MIX, etc.)

`include_optional`: Should we prompt the user for optional variables?

`include_expert`: Should we prompt the user for expert_only variables?

Returns: None: Has no return, but this function modifies the ‘`model_object`’ object.

yaml Package

yaml Package

class `MakeItSo.yaml.YAMLObject`

Bases: `object`

An object that can dump itself to a YAML stream and load itself from a YAML stream.

classmethod `from_yaml(loader, node)`

Convert a representation node to a Python object.

classmethod `to_yaml(dumper, data)`

Convert a Python object to a representation node.

`yaml_dumper`

alias of `Dumper`

`yaml_loader`

alias of `Loader`

class `MakeItSo.yaml.YAMLObjectMetaclass(name, bases, kwds)`

Bases: `type`

The metaclass for `YAMLObject`.

`MakeItSo.yaml.add_constructor` (*tag*, *constructor*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*)

Add a constructor for the given tag. Constructor is a function that accepts a Loader instance and a node object and produces the corresponding Python object.

`MakeItSo.yaml.add_implicit_resolver` (*tag*, *regex*, *first=None*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*)

Add an implicit scalar detector. If an implicit scalar value matches the given regex, the corresponding tag is assigned to the scalar. *first* is a sequence of possible initial characters or *None*.

`MakeItSo.yaml.add_multi_constructor` (*tag_prefix*, *multi_constructor*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*)

Add a multi-constructor for the given tag prefix. Multi-constructor is called for a node if its tag starts with *tag_prefix*. Multi-constructor accepts a Loader instance, a tag suffix, and a node object and produces the corresponding Python object.

`MakeItSo.yaml.add_multi_representer` (*data_type*, *multi_representer*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*)

Add a representer for the given type. Multi-representer is a function accepting a Dumper instance and an instance of the given data type or subtype and producing the corresponding representation node.

`MakeItSo.yaml.add_path_resolver` (*tag*, *path*, *kind=None*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*)

Add a path based resolver for the given tag. A path is a list of keys that forms a path to a node in the representation tree. Keys can be string values, integers, or *None*.

`MakeItSo.yaml.add_representer` (*data_type*, *representer*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*)

Add a representer for the given type. Representer is a function accepting a Dumper instance and an instance of the given data type and producing the corresponding representation node.

`MakeItSo.yaml.compose` (*stream*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*)

Parse the first YAML document in a stream and produce the corresponding representation tree.

`MakeItSo.yaml.compose_all` (*stream*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*)

Parse all YAML documents in a stream and produce corresponding representation trees.

`MakeItSo.yaml.dump` (*data*, *stream=None*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*, ***kws*)

Serialize a Python object into a YAML stream. If *stream* is *None*, return the produced string instead.

`MakeItSo.yaml.dump_all` (*documents*, *stream=None*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*, *default_style=None*, *default_flow_style=None*, *canonical=None*, *indent=None*, *width=None*, *allow_unicode=None*, *line_break=None*, *encoding='utf-8'*, *explicit_start=None*, *explicit_end=None*, *version=None*, *tags=None*)

Serialize a sequence of Python objects into a YAML stream. If *stream* is *None*, return the produced string instead.

`MakeItSo.yaml.emit` (*events*, *stream=None*, *Dumper=<class 'MakeItSo.yaml.dumper.Dumper'>*, *canonical=None*, *indent=None*, *width=None*, *allow_unicode=None*, *line_break=None*)

Emit YAML parsing events into a stream. If *stream* is *None*, return the produced string instead.

`MakeItSo.yaml.load` (*stream*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*)

Parse the first YAML document in a stream and produce the corresponding Python object.

`MakeItSo.yaml.load_all` (*stream*, *Loader=<class 'MakeItSo.yaml.loader.Loader'>*)

Parse all YAML documents in a stream and produce corresponding Python objects.

`MakeItSo.yaml.parse` (*stream*, *Loader*=<class 'MakeItSo.yaml.loader.Loader'>)

Parse a YAML stream and produce parsing events.

`MakeItSo.yaml.safe_dump` (*data*, *stream*=None, ***kws*)

Serialize a Python object into a YAML stream. Produce only basic YAML tags. If stream is None, return the produced string instead.

`MakeItSo.yaml.safe_dump_all` (*documents*, *stream*=None, ***kws*)

Serialize a sequence of Python objects into a YAML stream. Produce only basic YAML tags. If stream is None, return the produced string instead.

`MakeItSo.yaml.safe_load` (*stream*)

Parse the first YAML document in a stream and produce the corresponding Python object. Resolve only basic YAML tags.

`MakeItSo.yaml.safe_load_all` (*stream*)

Parse all YAML documents in a stream and produce corresponding Python objects. Resolve only basic YAML tags.

`MakeItSo.yaml.scan` (*stream*, *Loader*=<class 'MakeItSo.yaml.loader.Loader'>)

Scan a YAML stream and produce scanning tokens.

`MakeItSo.yaml.serialize` (*node*, *stream*=None, *Dumper*=<class 'MakeItSo.yaml.dumper.Dumper'>, ***kws*)

Serialize a representation tree into a YAML stream. If stream is None, return the produced string instead.

`MakeItSo.yaml.serialize_all` (*nodes*, *stream*=None, *Dumper*=<class 'MakeItSo.yaml.dumper.Dumper'>, *canonical*=None, *indent*=None, *width*=None, *allow_unicode*=None, *line_break*=None, *encoding*='utf-8', *explicit_start*=None, *explicit_end*=None, *version*=None, *tags*=None)

Serialize a sequence of representation trees into a YAML stream. If stream is None, return the produced string instead.

composer Module

class `MakeItSo.yaml.composer.Composer`

Bases: `object`

`check_node` ()

`compose_document` ()

`compose_mapping_node` (*anchor*)

`compose_node` (*parent*, *index*)

`compose_scalar_node` (*anchor*)

`compose_sequence_node` (*anchor*)

`get_node` ()

`get_single_node` ()

exception `MakeItSo.yaml.composer.ComposerError` (*context*=None, *context_mark*=None, *problem*=None, *problem_mark*=None, *note*=None)

Bases: `MakeItSo.yaml.error.MarkedYAMLError`

constructor Module

```
class MakeItSo.yaml.constructor.BaseConstructor
    Bases: object

    classmethod add_constructor (tag, constructor)
    classmethod add_multi_constructor (tag_prefix, multi_constructor)
    check_data ()
    construct_document (node)
    construct_mapping (node, deep=False)
    construct_object (node, deep=False)
    construct_pairs (node, deep=False)
    construct_scalar (node)
    construct_sequence (node, deep=False)
    get_data ()
    get_single_data ()

class MakeItSo.yaml.constructor.SafeConstructor
    Bases: MakeItSo.yaml.constructor.BaseConstructor

    construct_mapping (node, deep=False)
    construct_scalar (node)
    construct_undefined (node)
    construct_yaml_binary (node)
    construct_yaml_bool (node)
    construct_yaml_float (node)
    construct_yaml_int (node)
    construct_yaml_map (node)
    construct_yaml_null (node)
    construct_yaml_object (node, cls)
    construct_yaml_omap (node)
    construct_yaml_pairs (node)
    construct_yaml_seq (node)
    construct_yaml_set (node)
    construct_yaml_str (node)
    construct_yaml_timestamp (node)
    flatten_mapping (node)

class MakeItSo.yaml.constructor.Constructor
    Bases: MakeItSo.yaml.constructor.SafeConstructor

    class classobj
        Constructor.construct_python_complex (node)
```

```

Constructor.construct_python_long (node)
Constructor.construct_python_module (suffix, node)
Constructor.construct_python_name (suffix, node)
Constructor.construct_python_object (suffix, node)
Constructor.construct_python_object_apply (suffix, node, newobj=False)
Constructor.construct_python_object_new (suffix, node)
Constructor.construct_python_str (node)
Constructor.construct_python_tuple (node)
Constructor.construct_python_unicode (node)
Constructor.find_python_module (name, mark)
Constructor.find_python_name (name, mark)
Constructor.make_python_instance (suffix, node, args=None, kwds=None, newobj=False)
Constructor.set_python_instance_state (instance, state)

```

```

exception MakeItSo.yaml.constructor.ConstructorError (context=None,          con-
                                                    text_mark=None,  problem=None,
                                                    problem_mark=None, note=None)

Bases: MakeItSo.yaml.error.MarkedYAMLError

```

cyaml Module

dumper Module

```

class MakeItSo.yaml.dumper.BaseDumper (stream, default_style=None, default_flow_style=None,
                                         canonical=None, indent=None, width=None, al-
                                         low_unicode=None, line_break=None, encoding=None,
                                         explicit_start=None, explicit_end=None, version=None,
                                         tags=None)

Bases:    MakeItSo.yaml.emitter.Emitter, MakeItSo.yaml.serializer.Serializer,
MakeItSo.yaml.representer.BaseRepresenter, MakeItSo.yaml.resolver.BaseResolver

class MakeItSo.yaml.dumper.SafeDumper (stream, default_style=None, default_flow_style=None,
                                         canonical=None, indent=None, width=None, al-
                                         low_unicode=None, line_break=None, encoding=None,
                                         explicit_start=None, explicit_end=None, version=None,
                                         tags=None)

Bases:    MakeItSo.yaml.emitter.Emitter, MakeItSo.yaml.serializer.Serializer,
MakeItSo.yaml.representer.SafeRepresenter, MakeItSo.yaml.resolver.Resolver

class MakeItSo.yaml.dumper.Dumper (stream, default_style=None, default_flow_style=None, canon-
                                     ical=None, indent=None, width=None, allow_unicode=None,
                                     line_break=None, encoding=None, explicit_start=None, ex-
                                     plicit_end=None, version=None, tags=None)

Bases:    MakeItSo.yaml.emitter.Emitter, MakeItSo.yaml.serializer.Serializer,
MakeItSo.yaml.representer.Representer, MakeItSo.yaml.resolver.Resolver

```


emitter Module

class MakeItSo.yaml.emitter.**Emitter**(*stream*, *canonical=None*, *indent=None*, *width=None*, *allow_unicode=None*, *line_break=None*)

Bases: object

analyze_scalar(*scalar*)

check_empty_document()

check_empty_mapping()

check_empty_sequence()

check_simple_key()

choose_scalar_style()

determine_block_hints(*text*)

emit(*event*)

expect_alias()

expect_block_mapping()

expect_block_mapping_key(*first=False*)

expect_block_mapping_simple_value()

expect_block_mapping_value()

expect_block_sequence()

expect_block_sequence_item(*first=False*)

expect_document_end()

expect_document_root()

expect_document_start(*first=False*)

expect_first_block_mapping_key()

expect_first_block_sequence_item()

expect_first_document_start()

expect_first_flow_mapping_key()

expect_first_flow_sequence_item()

expect_flow_mapping()

expect_flow_mapping_key()

expect_flow_mapping_simple_value()

expect_flow_mapping_value()

expect_flow_sequence()

expect_flow_sequence_item()

expect_node(*root=False*, *sequence=False*, *mapping=False*, *simple_key=False*)

expect_nothing()

expect_scalar()

```

expect_stream_start ()
flush_stream ()
increase_indent (flow=False, indentless=False)
need_events (count)
need_more_events ()
prepare_anchor (anchor)
prepare_tag (tag)
prepare_tag_handle (handle)
prepare_tag_prefix (prefix)
prepare_version (version)
process_anchor (indicator)
process_scalar ()
process_tag ()
write_double_quoted (text, split=True)
write_folded (text)
write_indent ()
write_indicator (indicator, need_whitespace, whitespace=False, indentation=False)
write_line_break (data=None)
write_literal (text)
write_plain (text, split=True)
write_single_quoted (text, split=True)
write_stream_end ()
write_stream_start ()
write_tag_directive (handle_text, prefix_text)
write_version_directive (version_text)
exception MakeItSo.yaml.emitter.EmitterError
    Bases: MakeItSo.yaml.error.YAMLError

```

error Module

```

class MakeItSo.yaml.error.Mark (name, index, line, column, buffer, pointer)
    Bases: object

    get_snippet (indent=4, max_length=75)
exception MakeItSo.yaml.error.YAMLError
    Bases: exceptions.Exception
exception MakeItSo.yaml.error.MarkedYAMLError (context=None,          context_mark=None,
                                                problem=None,        problem_mark=None,
                                                note=None)
    Bases: MakeItSo.yaml.error.YAMLError

```

events Module

```

class MakeItSo.yaml.events.AliasEvent (anchor, start_mark=None, end_mark=None)
    Bases: MakeItSo.yaml.events.NodeEvent

class MakeItSo.yaml.events.CollectionEndEvent (start_mark=None, end_mark=None)
    Bases: MakeItSo.yaml.events.Event

class MakeItSo.yaml.events.CollectionStartEvent (anchor, tag, implicit, start_mark=None,
                                                    end_mark=None, flow_style=None)
    Bases: MakeItSo.yaml.events.NodeEvent

class MakeItSo.yaml.events.DocumentEndEvent (start_mark=None, end_mark=None, ex-
                                                    plicit=None)
    Bases: MakeItSo.yaml.events.Event

class MakeItSo.yaml.events.DocumentStartEvent (start_mark=None, end_mark=None, ex-
                                                    plicit=None, version=None, tags=None)
    Bases: MakeItSo.yaml.events.Event

class MakeItSo.yaml.events.Event (start_mark=None, end_mark=None)
    Bases: object

class MakeItSo.yaml.events.MappingEndEvent (start_mark=None, end_mark=None)
    Bases: MakeItSo.yaml.events.CollectionEndEvent

class MakeItSo.yaml.events.MappingStartEvent (anchor, tag, implicit, start_mark=None,
                                                    end_mark=None, flow_style=None)
    Bases: MakeItSo.yaml.events.CollectionStartEvent

class MakeItSo.yaml.events.NodeEvent (anchor, start_mark=None, end_mark=None)
    Bases: MakeItSo.yaml.events.Event

class MakeItSo.yaml.events.ScalarEvent (anchor, tag, implicit, value, start_mark=None,
                                                    end_mark=None, style=None)
    Bases: MakeItSo.yaml.events.NodeEvent

class MakeItSo.yaml.events.SequenceEndEvent (start_mark=None, end_mark=None)
    Bases: MakeItSo.yaml.events.CollectionEndEvent

class MakeItSo.yaml.events.SequenceStartEvent (anchor, tag, implicit, start_mark=None,
                                                    end_mark=None, flow_style=None)
    Bases: MakeItSo.yaml.events.CollectionStartEvent

class MakeItSo.yaml.events.StreamEndEvent (start_mark=None, end_mark=None)
    Bases: MakeItSo.yaml.events.Event

class MakeItSo.yaml.events.StreamStartEvent (start_mark=None, end_mark=None, encod-
                                                    ing=None)
    Bases: MakeItSo.yaml.events.Event

```

loader Module

```

class MakeItSo.yaml.loader.BaseLoader (stream)
    Bases: MakeItSo.yaml.reader.Reader, MakeItSo.yaml.scanner.Scanner,
            MakeItSo.yaml.parser.Parser, MakeItSo.yaml.composer.Composer,
            MakeItSo.yaml.constructor.BaseConstructor, MakeItSo.yaml.resolver.BaseResolver

class MakeItSo.yaml.loader.SafeLoader (stream)
    Bases: MakeItSo.yaml.reader.Reader, MakeItSo.yaml.scanner.Scanner,

```

```
MakeItSo.yaml.parser.Parser,                MakeItSo.yaml.composer.Composer,  
MakeItSo.yaml.constructor.SafeConstructor, MakeItSo.yaml.resolver.Resolver
```

```
class MakeItSo.yaml.loader.Loader (stream)  
    Bases:      MakeItSo.yaml.reader.Reader,      MakeItSo.yaml.scanner.Scanner,  
               MakeItSo.yaml.parser.Parser,       MakeItSo.yaml.composer.Composer,  
               MakeItSo.yaml.constructor.Constructor, MakeItSo.yaml.resolver.Resolver
```

nodes Module

```
class MakeItSo.yaml.nodes.CollectionNode (tag, value, start_mark=None, end_mark=None,  
                                           flow_style=None)
```

```
    Bases: MakeItSo.yaml.nodes.Node
```

```
class MakeItSo.yaml.nodes.MappingNode (tag, value, start_mark=None, end_mark=None,  
                                       flow_style=None)
```

```
    Bases: MakeItSo.yaml.nodes.CollectionNode
```

```
class MakeItSo.yaml.nodes.Node (tag, value, start_mark, end_mark)
```

```
    Bases: object
```

```
class MakeItSo.yaml.nodes.ScalarNode (tag, value, start_mark=None, end_mark=None,  
                                       style=None)
```

```
    Bases: MakeItSo.yaml.nodes.Node
```

```
class MakeItSo.yaml.nodes.SequenceNode (tag, value, start_mark=None, end_mark=None,  
                                         flow_style=None)
```

```
    Bases: MakeItSo.yaml.nodes.CollectionNode
```

parser Module

```
class MakeItSo.yaml.parser.Parser
```

```
    Bases: object
```

```
    check_event (*choices)
```

```
    get_event ()
```

```
    parse_block_mapping_first_key ()
```

```
    parse_block_mapping_key ()
```

```
    parse_block_mapping_value ()
```

```
    parse_block_node ()
```

```
    parse_block_node_or_indentless_sequence ()
```

```
    parse_block_sequence_entry ()
```

```
    parse_block_sequence_first_entry ()
```

```
    parse_document_content ()
```

```
    parse_document_end ()
```

```
    parse_document_start ()
```

```
    parse_flow_mapping_empty_value ()
```

```
    parse_flow_mapping_first_key ()
```

```
    parse_flow_mapping_key (first=False)
```

```

    parse_flow_mapping_value()
    parse_flow_node()
    parse_flow_sequence_entry(first=False)
    parse_flow_sequence_entry_mapping_end()
    parse_flow_sequence_entry_mapping_key()
    parse_flow_sequence_entry_mapping_value()
    parse_flow_sequence_first_entry()
    parse_implicit_document_start()
    parse_indentless_sequence_entry()
    parse_node(block=False, indentless_sequence=False)
    parse_stream_start()
    peek_event()
    process_directives()
    process_empty_scalar(mark)
exception MakeItSo.yaml.parser.ParserError(context=None, context_mark=None, prob-
                                             lem=None, problem_mark=None, note=None)
    Bases: MakeItSo.yaml.error.MarkedYAMLError

```

reader Module

```

class MakeItSo.yaml.reader.Reader(stream)
    Bases: object
    check_printable(data)
    determine_encoding()
    forward(length=1)
    get_mark()
    peek(index=0)
    prefix(length=1)
    update(length)
    update_raw(size=1024)
exception MakeItSo.yaml.reader.ReaderError(name, position, character, encoding, reason)
    Bases: MakeItSo.yaml.error.YAMLError

```

representer Module

```

class MakeItSo.yaml.representer.BaseRepresenter(default_style=None, de-
                                                fault_flow_style=None)
    Bases: object
    classmethod add_multi_representer(data_type, representer)
    classmethod add_representer(data_type, representer)

```

```

    get_classobj_bases (cls)
    ignore_aliases (data)
    represent (data)
    represent_data (data)
    represent_mapping (tag, mapping, flow_style=None)
    represent_scalar (tag, value, style=None)
    represent_sequence (tag, sequence, flow_style=None)
class MakeItSo.yaml.representer.SafeRepresenter (default_style=None,          de-
                                                fault_flow_style=None)
    Bases: MakeItSo.yaml.representer.BaseRepresenter
    ignore_aliases (data)
    represent_bool (data)
    represent_date (data)
    represent_datetime (data)
    represent_dict (data)
    represent_float (data)
    represent_int (data)
    represent_list (data)
    represent_long (data)
    represent_none (data)
    represent_set (data)
    represent_str (data)
    represent_undefined (data)
    represent_unicode (data)
    represent_yaml_object (tag, data, cls, flow_style=None)
class MakeItSo.yaml.representer.Representer (default_style=None, default_flow_style=None)
    Bases: MakeItSo.yaml.representer.SafeRepresenter
    represent_complex (data)
    represent_instance (data)
    represent_long (data)
    represent_module (data)
    represent_name (data)
    represent_object (data)
    represent_str (data)
    represent_tuple (data)
    represent_unicode (data)
exception MakeItSo.yaml.representer.RepresenterError
    Bases: MakeItSo.yaml.error.YAMLError

```

resolver Module

```
class MakeItSo.yaml.resolver.BaseResolver
    Bases: object

    classmethod add_implicit_resolver (tag, regexp, first)
    classmethod add_path_resolver (tag, path, kind=None)
    ascend_resolver ()
    check_resolver_prefix (depth, path, kind, current_node, current_index)
    descend_resolver (current_node, current_index)
    resolve (kind, value, implicit)

class MakeItSo.yaml.resolver.Resolver
    Bases: MakeItSo.yaml.resolver.BaseResolver
```

scanner Module

```
class MakeItSo.yaml.scanner.Scanner
    Bases: object

    add_indent (column)
    check_block_entry ()
    check_directive ()
    check_document_end ()
    check_document_start ()
    check_key ()
    check_plain ()
    check_token (*choices)
    check_value ()
    fetch_alias ()
    fetch_anchor ()
    fetch_block_entry ()
    fetch_block_scalar (style)
    fetch_directive ()
    fetch_document_end ()
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```

```
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```



```

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stale_possible_simple_keys()
unwind_indent(column)

```

```

exception MakeItSo.yaml.scanner.ScannerError(context=None, context_mark=None, problem=None, problem_mark=None, note=None)
Bases: MakeItSo.yaml.error.MarkedYAMLError

```

serializer Module

```

class MakeItSo.yaml.serializer.Serializer(encoding=None, explicit_start=None, explicit_end=None, version=None, tags=None)
Bases: object
anchor_node(node)
close()
generate_anchor(node)
open()
serialize(node)
serialize_node(node, parent, index)
exception MakeItSo.yaml.serializer.SerializerError
Bases: MakeItSo.yaml.error.YAMLError

```

tokens Module

```

class MakeItSo.yaml.tokens.AliasToken(value, start_mark, end_mark)
Bases: MakeItSo.yaml.tokens.Token
class MakeItSo.yaml.tokens.AnchorToken(value, start_mark, end_mark)
Bases: MakeItSo.yaml.tokens.Token
class MakeItSo.yaml.tokens.BlockEndToken(start_mark, end_mark)
Bases: MakeItSo.yaml.tokens.Token
class MakeItSo.yaml.tokens.BlockEntryToken(start_mark, end_mark)
Bases: MakeItSo.yaml.tokens.Token

```

```
class MakeItSo.yaml.tokens.BlockMappingStartToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.BlockSequenceStartToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.DirectiveToken (name, value, start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.DocumentEndToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.DocumentStartToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.FlowEntryToken (start_mark, end_mark)
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    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.FlowSequenceStartToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.KeyToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.ScalarToken (value, plain, start_mark, end_mark, style=None)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.StreamEndToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.StreamStartToken (start_mark=None, end_mark=None, encoding=None)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.TagToken (value, start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token

class MakeItSo.yaml.tokens.Token (start_mark, end_mark)
    Bases: object

class MakeItSo.yaml.tokens.ValueToken (start_mark, end_mark)
    Bases: MakeItSo.yaml.tokens.Token
```

FREQUENTLY ASKED QUESTIONS

6.1 Configuration Questions

6.1.1 I get the error `python: No such file or directory`

- Solution: Your environment cannot find the path to the Python executable. Locate the `python` binary and either add it to your `PATH` environment variable:

```
export PATH=/path/to/python/bin:$PATH
```

or execute `makeItSo` via the full path to Python, such as:

```
/path/to/bin/python makeItSo.py
```

6.1.2 I get the error `ImportError: No module named Environments`

- Solution: You must not move “`makeItSo.py`” or any of the subdirectories (`Environments`, `Models`, `share`, `yaml`, etc.). To run `makeItSo`, use an absolute path to the `makeItSo.py` script.
- *genindex*
- *modindex*
- *search*

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