Arctic Thermokarst Model Project Description: Phase 3

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# Introduction

The Arctic Thermokarst Model (ATM) models thermokarst disturbances in the Alaskan arctic and boreal forests, as discussed in more detail in the introduction to the report on [Phase 1](https://github.com/gina-alaska/arctic_thermokarst_model/blob/master/documents/Arctic_Thermokarst_Model_Phase_0_1.docx) [1]. Phase 1 and 2 focused on the expanding the capabilities, and improving the data structurers for the ATM. Originally phase 2 was going to include the integration of the new data structures designed in that phase, but that was deemed to be difficult to before the model configuration system was redesigned, and moved to a later phase. Phase 3 will tackle the reading and internal management of the control files and internal management of the configuration values.

# Phase 3: Control Files

The control files for the ATM contain all of the information needed for modeling the transition of area between cohorts. These files are structured as a main control file that is used to launch the ATM, and control files for each of the cohorts, and other model inputs. The main control files contain the directory structure for the model. This phase also archived a set of control files that should run the barrow region, in the directory ‘example\_control\_files’. See the [Project board](https://github.com/gina-alaska/arctic_thermokarst_model/projects/3?)[2] or Issues [List](https://github.com/gina-alaska/arctic_thermokarst_model/milestone/3)[3] for issues in this phase.

The first thing that needed to be handled was the reading of the control files. These files consist of key value pairs, or lists. The key value pair files are the most common, and consist of white space separated key value pairs on each line. The list files contain an item on each line. In the current frame work the files are read in several places, with duplicated code. ‘atm/io/control\_file.py’ was created to centralize the reading of these file. A function to write the files was also created.

Next an object was created to manage the configuration values stored in the control files. In the current framework the configuration values are stored as attributes of the main ATM class in ‘atm/ATM.py’. These attributes are created as they are read across the different initialization functions. The new object centralized the configuration. When the new object is loaded, the main control file is passed as input, and loaded. The other control files are loaded, from the information in the main control file. The configuration is stored in a hierarchal dictionary with the main values at the highest level, and the values from the other files at the next level down. For example: CONFIGURATION[‘Simulation\_area`] will access a value from the main control file, and CONFIGURATION[‘Lake\_Pond\_Control`][‘ Lake\_Distribution’] will access a value form the file ’00\_lake\_pond\_control’.

The values in the new control are accessible via an overloaded \_\_getitem\_\_, and \_\_getattr\_\_ functions. The \_\_setitem\_\_ function is also overloaded allowing runtime configuration values to be set. The values loaded at the objects initialization are protected from being over written by the objects this \_\_setitem\_\_ function.

# Issues Encountered

This phase arose as an issue with development during phase 2, but there were no major issues in countered during this phase of development itself.

An Issue in phase 2 that was not recorded in that report was a problem with the loading of the raster files. Bob’s initial code for resizing the grid had a bug causing the resized grid to be off by one row and one column of initial grid elements. The bug was caused by an index being off by one. This still needs to be tested once the object for fractional areas is integrated.

# Phase 4: Moving Forward

Phase 4 will included the reaming integration tasks from phase 2, and new tasks for creating input rasters, and control files for the entire Arctic Costal Plane. Future improvements to the control objects could include the ability save the configuration values.

# References

[1] Phase 1 status report: <https://github.com/gina-alaska/arctic_thermokarst_model/blob/master/documents/Arctic_Thermokarst_Model_Phase_0_1.docx>

[2] Phase 2 project board: <https://github.com/gina-alaska/arctic_thermokarst_model/projects/3>?

[3] Issues <https://github.com/gina-alaska/arctic_thermokarst_model/milestone/3>