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Supplement of

An approach to computing discrete adjoints for MPI-parallelized models applied to Ice Sheet System Model 4.11

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1 Supplement

Algorithmic Differentiation using ISSM is only supported for a certain subset of compilers. The port has been achieved on Linux platforms using the GCC suite of compilers. Here, we present the specific set of instructions regarding installation of ISSM with ADOL-C support. They build on the instructions for installation of the regular ISSM package, which can be found at
5 <http://issm.jpl.nasa.gov/download/unix>.

The main difference when dealing with compiling ISSM with ADOL-C support turned on lies in the additional installation of the ADOL-C and AdjoinableMPI layers.

- 10 – The AdjoinableMPI layer can be installed using the standard `install.sh` script found in the `externalpackages` directory of the ISSM trunk. The Mercurial repository for AdjoinableMPI is <http://mercurial.mcs.anl.gov//ad/AdjoinableMPI>.
- 15 – The ADOL-C package can be installed using the specific `install-withmpi.sh` script found in the `externalpackages` directory of the ISSM trunk. The git repository for ADOL-C is <https://gitlab.com/adol-c/adol-c.git>. The `install-withmpi.sh` script makes sure that the ADOL-C installation enables `mpi` (`-enable-mpi`) and that it include the AdjoinableMPI bindings (`-with-mpi` option).

Once both packages are compiled, ISSM needs to be re-compiled with a configuration that uses GCC compilers, and that includes the following:

```
20 --with-adolc-dir=$ISSM_DIR/externalpackages/adolc/install \  
--with-mpi-dir=$ISSM_DIR/externalpackages/adjoinablempi/install
```

Once ISSM is recompiled, one can test the AD runs using the ISSM nightly run suite found in the `test/NightlyRuns` sub-directory of the ISSM trunk. All tests numbered 3000 and more are AD related tests, and have been used for validation of the ISSM AD capabilities. They provide a good starting point for users to build on.