

SPERR

Wavelet-Based Lossy Compressor for Scientific Data

github.com/NCAR/SPERR | C++ | Fortran

What is SPERR?

- Lossy compressor designed for scientific **floating-point** data: **2D/3D**
- Uses **CDF 9/7 wavelet transforms** for decorrelation
- Use embedded coefficient coding: SPECK
- Use **outlier correction** to bound point-wise error (PWE)

What makes SPERR appealing

- Effective in a wide range of compression qualities:
 - **Low quality:** scientific visualization
 - **High quality:** archiving double-precision data in qualities comparable to single-precision
- Provides one of the **best** compression ratios
- Advanced decoding modes: flexible-rate and multi-resolution
- (Slower than the fastest compressors)

Three Compression Modes

Rate (BPP)

Fixed output size

PSNR

Fixed **overall** quality (peak signal-to-noise ratio)

PWE

Provides a guaranteed PWE

H5Z-SPERR

HDF5 plugin for SPERR

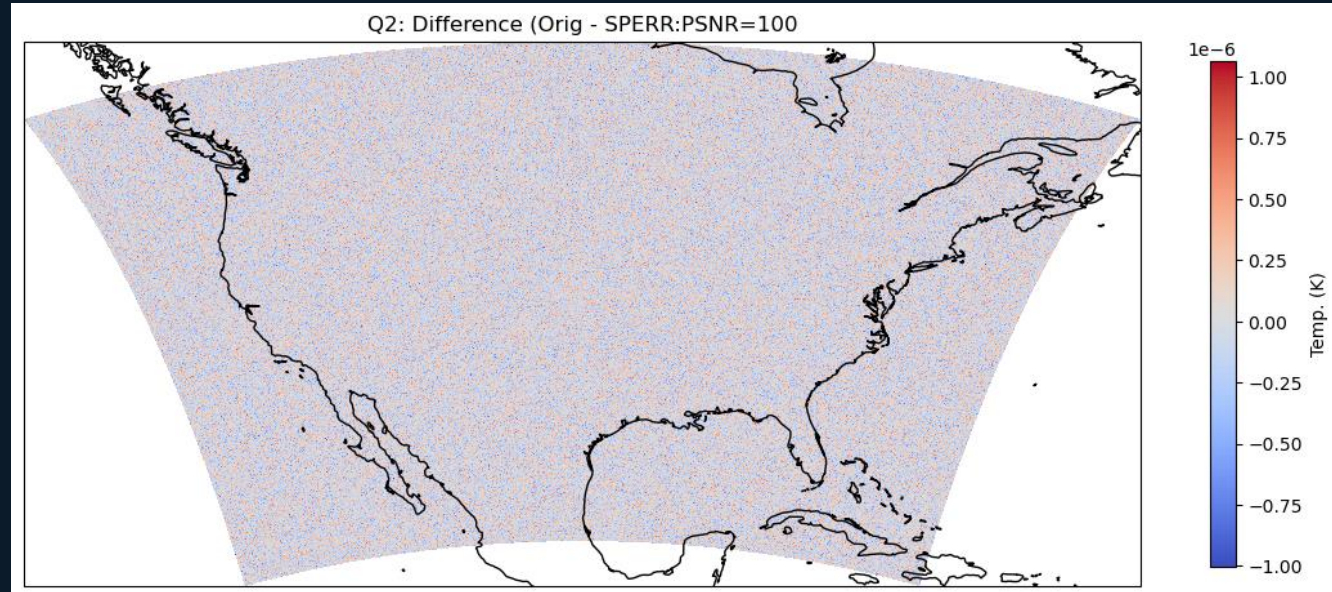
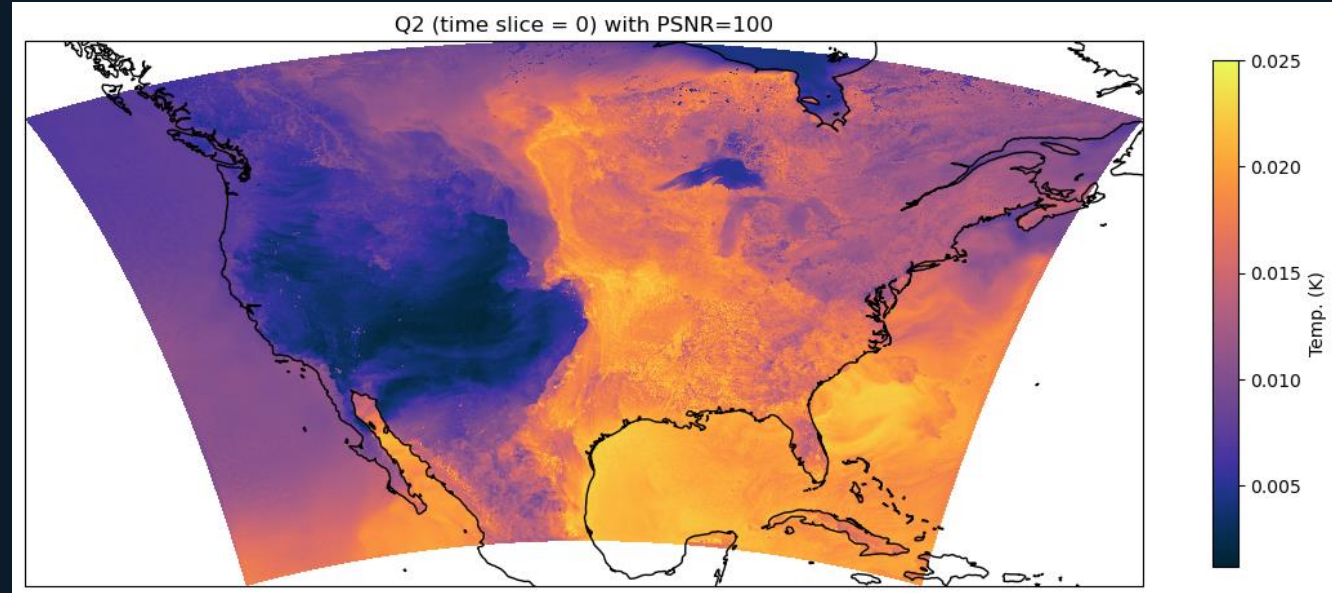
github.com/NCAR/H5Z-SPERR | Official Plugin ID: 32028

What makes H5Z-SPERR appealing?

- Brings SPERR compression to the NetCDF ecosystem
 - Compression appears transparent to users/tools
- Efficiently masks “missing values” common in earth-sciences data sets: NaN or extreme values.
- Available in a Python package, `hdf5plugin`, too

**Our favorite
command:**

```
nccopy -F "<var_name>, <cd_vals>" <in_file> <out_file>
```



How to Build

Prerequisites:

- Compiler, CMake, (HDF5/NetCDF)
 - Internet connection
-

SPERR

1. Follow steps described here to build and install:
<https://github.com/ncar/sperr?tab=readme-ov-file#quick-build>
2. CLI utilities will be placed in the bin directory:
 1. sperr3d is used to compress/decompress a 3D volume
 2. sperr2d is used to compress/decompress a 2D slice
 3. they compress raw binary files with floating-point values into custom packed bitstreams, or vice versa
3. CLI utilities have detailed help messages; see them using the -h flag:
(./bin/sperr3d -h) (./bin/sperr2d -h)

H5Z-SPERR

1. Install SPERR, HDF5, and NetCDF first
2. Follow steps described here to build and install H5Z-SPERR:
<https://github.com/NCAR/H5Z-SPERR?tab=readme-ov-file#build-and-install>
3. Set environment variables so it can be used by HDF5 and NetCDF as a dynamically loaded plugin:
 1. export HDF5_ROOT=/path/to/HDF5/installation
 2. export HDF5_PLUGIN_PATH=/path/to/H5Z-SPERR/installation
4. See example **nccopy** commands in:
<https://github.com/NCAR/H5Z-SPERR?tab=readme-ov-file#examples>