

Non-equilibrium ionization in RH

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By default, RH assumes statistical equilibrium, which is not a good assumption especially for the first few seconds of flare heating and cooling. We have now modified the code to take non-equilibrium ionization into account in a very simple way. That is, to use the number densities from RADYN simulations as input, and fix them during the PRD iterations.

The normal routine to achieve this would be:

1. Construct a file named `output_aux.ncdf`. The NLTE population should be directly from the RADYN outputs. Other variables in the file (see the manual for the structure) must present, but the values can be zero.
2. Put the `output_aux.ncdf` file into the output directory.
3. Revise the `INITIAL_SOLUTION` for the `ACTIVE` atoms in `atoms.input` from `ZERO_RADIATION` to `OLD_POPULATIONS`. The population file should be specified as `output/output_aux.ncdf`.
4. Run.

If we are calculating the H lines, then the first few lines of `atoms.input` should be like this:

```
# Nmetal
16
```

```
# Metals
```

```
# model file      ACTIVE/PASSIVE  INITIAL_SOLUTION  population file
```

```
Atoms/H_6.atom    ACTIVE          OLD_POPULATIONS   output/output_aux.ncdf
Atoms/He.atom     PASSIVE         LTE_POPULATIONS
Atoms/C.atom      PASSIVE         LTE_POPULATIONS
Atoms/N.atom      PASSIVE         LTE_POPULATIONS
Atoms/O.atom      PASSIVE         LTE_POPULATIONS
```

```
...
```