ASAP: automatic spectral line search and baselining

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Spectral lines are expected to be much narrower than the baseline undulations.

One can calculate running mean and variance and compare them with the fluxes of individual spectral channels.
Line search: problems

- Baseline may have a significant slope
- Work with the residual of the linear least square fit

The off-line noise is unknown if we don’t know where the lines are. Strong lines can affect the statistics and create spurious absorption features. Line wings are below a detection threshold.
Line search: problems

- Baseline may have a significant slope
- The off-line noise is unknown if we don’t know where the lines are
  - Use the mean of, say 80%, smallest values of the variance calculated for different box positions
Line search: problems

- Baseline may have a significant slope
- The off-line noise is unknown if we don’t know where the lines are
- Strong lines can affect the statistics and create spurious absorption features
  - Multiple iterations
Baseline may have a significant slope

The off-line noise is unknown if we don’t know where the lines are

Strong lines can affect the statistics and create spurious absorption features

Line wings are below a detection threshold
  - Need a wing detection procedure
Line search: problems

- Baseline may have a significant slope
- The off-line noise is unknown if we don’t know where the lines are
- Strong lines can affect the statistics and create spurious absorption features
- Line wings are below a detection threshold
- Oversampled lines
  - Internal averaging
# Line search

```python
fl = linefinder()
fl.set_scan(scan, edge=(200, 100))
fl.set_options(threshold=3)
nlines = fl.find_lines()
if nlines != 0:
    print "Found", nlines, "spectral lines:", fl.get_ranges()
else:
    print "No lines found!"
```

# automatic baselining

```python
scan.auto_poly_baseline(order=3)
```
Examples: A spectrum from Mopra

For this Mopra spectrum, the algorithm with the rejection of 50 channels from each side and $3\sigma$ detection limit finds the line at \(522-580\) channels.
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Examples: a weak line

For this spectrum, the algorithm detects a line above the $3\sigma$ detection limit at 4086–4108 channels. Averaging of adjacent channels is necessary here to reveal the line.
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