

# Documentation for LMDZ, Planets version

## The vertical discretization

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### 1 Theoretical aspects

The position of the layers:

- pressure limit between two layers,
- pressure within the layers

The Exner function: definition. It corresponds to the pressure levels within the layers. Used for the computation of the potential temperature. For the Earth, we use a specific scheme that computes these positions so that it maintains a condition of proportionality between total, internal and potential energy (cf. a note from F. Hourdin).

### 2 Pratical aspects in the code

- `disvert_[no]terre.F[90]`: position of the interface pressure levels from an input file (several possibilities). Definition of `ap`, `bp` and `presnivs`. In the planetary version, definition of `aps` and `bps`.

This is done only once, called at the beginning from `iniconst.F`.

- Interface pressures: computed in `caldyn0.F`, `caldyn.F`, `integrd.F`, `leapfrog.F` through the `presion.F` routine.
- Exner function (and therefore pressure within the layers): computed at three different places in `leapfrog.F` through the `exner_[hyb/milieu].F` routine. For the Earth, we use `exner_hyb.F`, that computes the positions in a specific way to maintain a condition of proportionality between total, internal and potential energy (cf. a note from F. Hourdin). For other planets, we use `exner_milieu.F`, that computes the positions of these pressure levels exactly in the middle of each layer. Though this fails to maintain the previous condition, there is no evidence of any significant influence on the results, and it makes it a lot easier to define correctly the level positions with the input file.