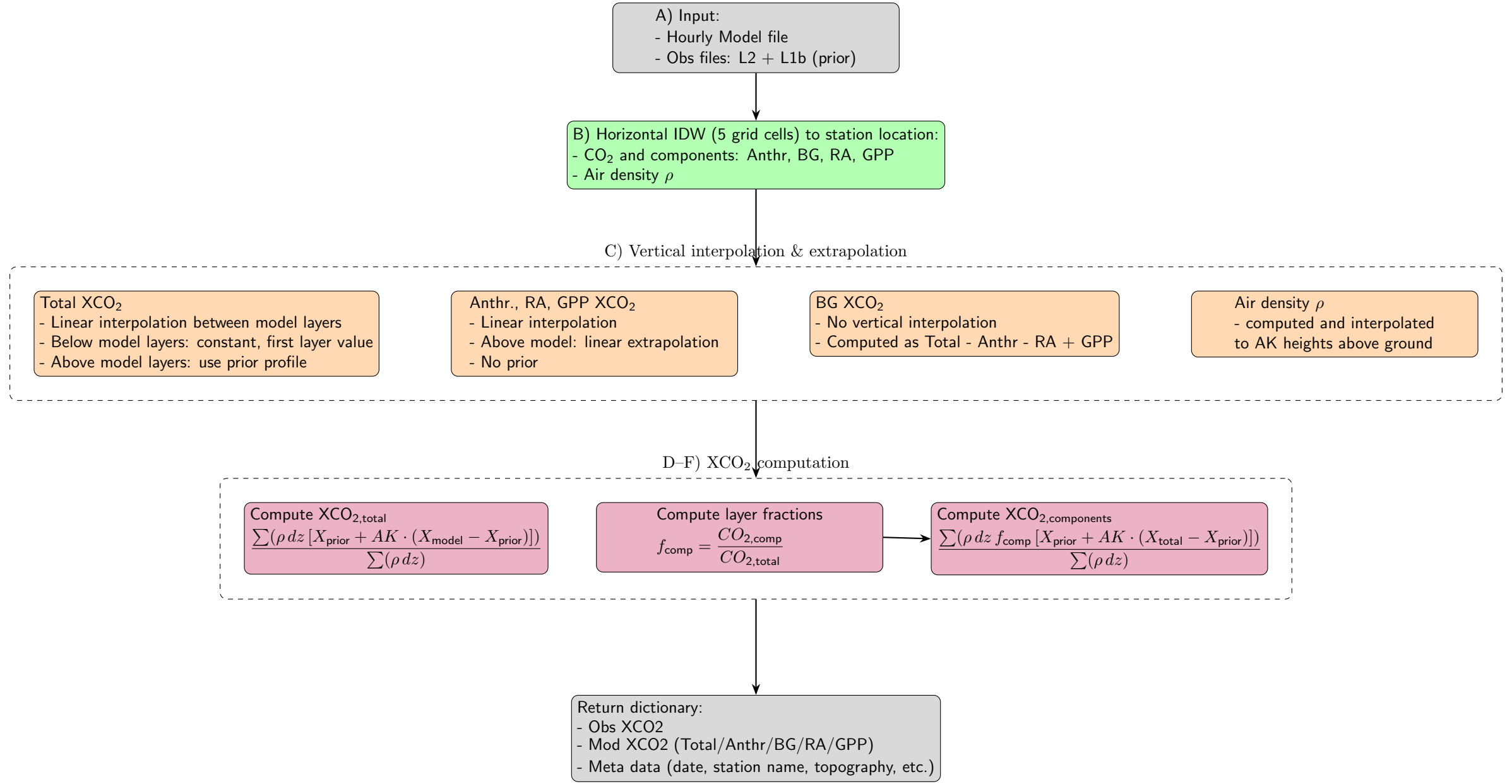
A) Input:
- Hourly Model file
- Obs files: L2 + L1b (prior)
B) Horizontal IDW (5 grid cells) to station location:
- CO_2 and components: Anthr, BG, RA, GPP
- Air density ρ
C) Vertical interpolation & extrapolation
Total XCO_2
- Linear interpolation between model layers
- Below model layers: constant, first layer value
- Above model layers: use prior profile
Anthr., RA, GPP XCO_2
- Linear interpolation
- Above model: linear extrapolation
- No prior
BG XCO_2
- No vertical interpolation
- Computed as Total - Anthr - RA + GPP
Air density ρ
- computed and interpolated
to AK heights above ground
D–F) XCO_2 computation
Compute $XCO_{2,\text{total}}$
$\frac{\sum(\rho\, dz\, [X_{\text{prior}} + AK \cdot (X_{\text{model}} - X_{\text{prior}})])}{\sum(\rho\, dz)}$
Compute layer fractions
$f_{\text{comp}} = \frac{CO_{2,\text{comp}}}{CO_{2,\text{total}}}$
Compute $XCO_{2,\text{components}}$
$\frac{\sum(\rho\, dz\, f_{\text{comp}}\, [X_{\text{prior}} + AK \cdot (X_{\text{total}} - X_{\text{prior}})])}{\sum(\rho\, dz)}$
Return dictionary:
- Obs XCO2
- Mod XCO2 (Total/Anthr/BG/RA/GPP)
- Meta data (date, station name, topography, etc.)