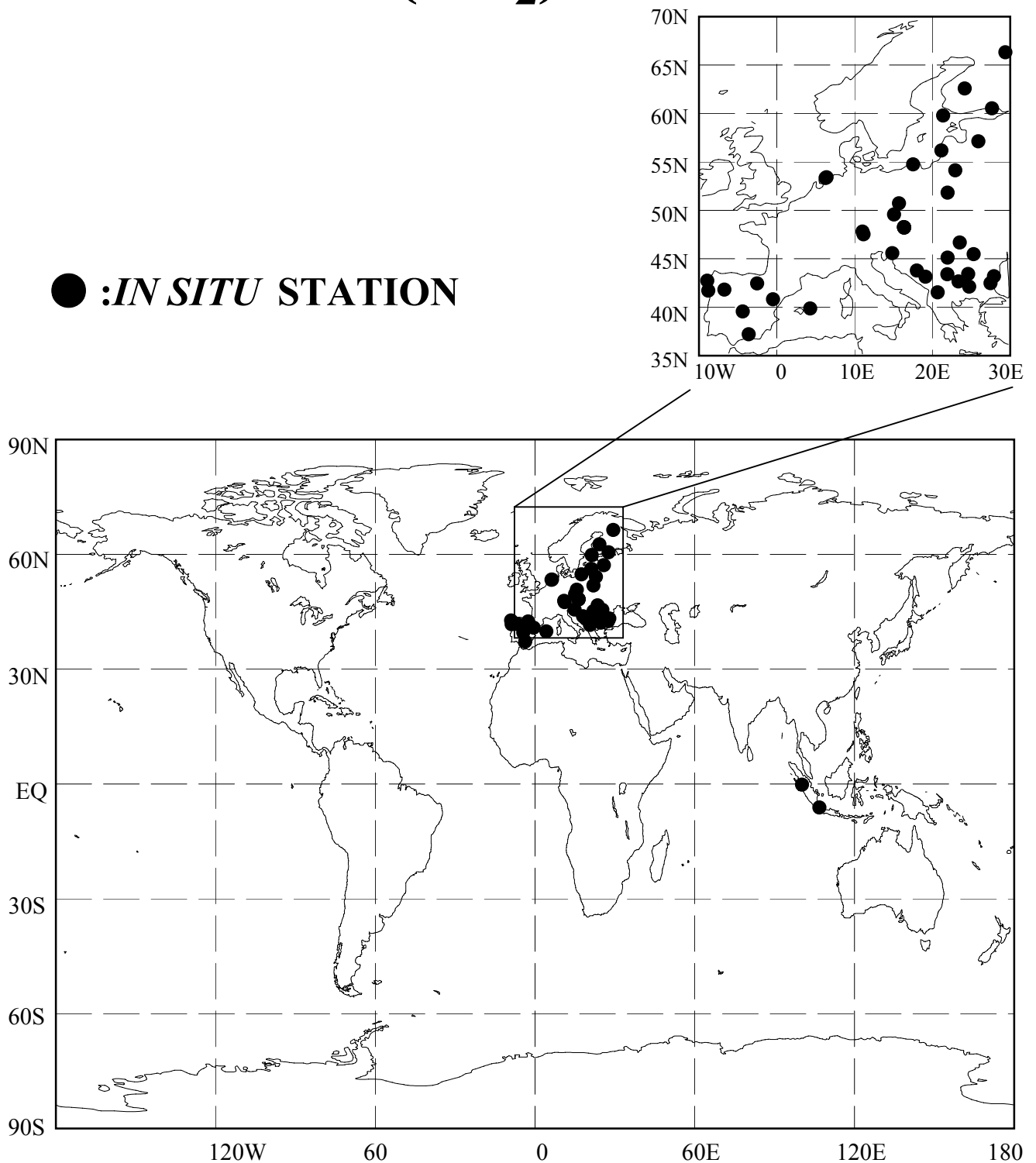


● :*IN SITU* STATION



10. Sulphur Dioxide (SO₂)

Sulphur dioxide (SO₂) is not a greenhouse gas; rather, it is a precursor of atmospheric sulphuric acid (H₂SO₄) or sulphate aerosol. SO₂ is oxidised by hydroxyl radicals (OH) to form sulphuric acid, which then produces aerosol through photochemical gas-to-particle conversion. While the SO₂ reaction with OH is much slower than with NO₂, SO₂ dissolves easily in suspended droplets in the atmosphere.

Sources of SO₂ include fossil fuel combustion by industries, biomass burning, volcanoes, and the oxidation of dimethylsulphide (DMS) from oceans (IPCC, 2001). Major SO₂ sinks are oxidation by OH and deposition onto wet surfaces. Anthropogenic SO₂ has caused acid rain and deposition throughout the industrial era. SO₂ concentrations have large variability in space and time because of the species' short lifetime and uneven anthropogenic source distribution.

Observation stations that submitted data for SO₂ to the WDCGG are shown on the map at the beginning of this chapter. Most of the contributing stations are located in Europe.

Plate 10.1 shows the time series of monthly mean concentrations of SO₂ for individual stations, colour-coded to indicate the concentration level. Please note that the data on SO₂ is reported in various units, viz., ppb, µg/m³, mg/m³ and µgS/m³. All units are converted to ppb as follows:

$$\begin{aligned}X_p [\text{ppb}] &= (R * T / M / P_0) * 10 * X_g [\mu\text{g}/\text{m}^3] \\X_p [\text{ppb}] &= (R * T / M / P_0) * 10^4 * X_g [\text{mg}/\text{m}^3] \\X_p [\text{ppb}] &= (R * T / M_s / P_0) * 10 * X_g [\mu\text{gS}/\text{m}^3]\end{aligned}$$

where R is the molar gas constant (8.31451 [J/K/mol]),
T is the absolute temperature reported by an individual station,
M is the molecular weight of SO₂ (64.0648),
M_s is the atomic weight of S (32.066), and
P₀ is the standard pressure (1013.25 [hPa]).

Certain stations in southern Europe show higher concentrations. However, it is difficult to identify an increasing or decreasing trend for SO₂ concentrations.

SO₂ Monthly Data

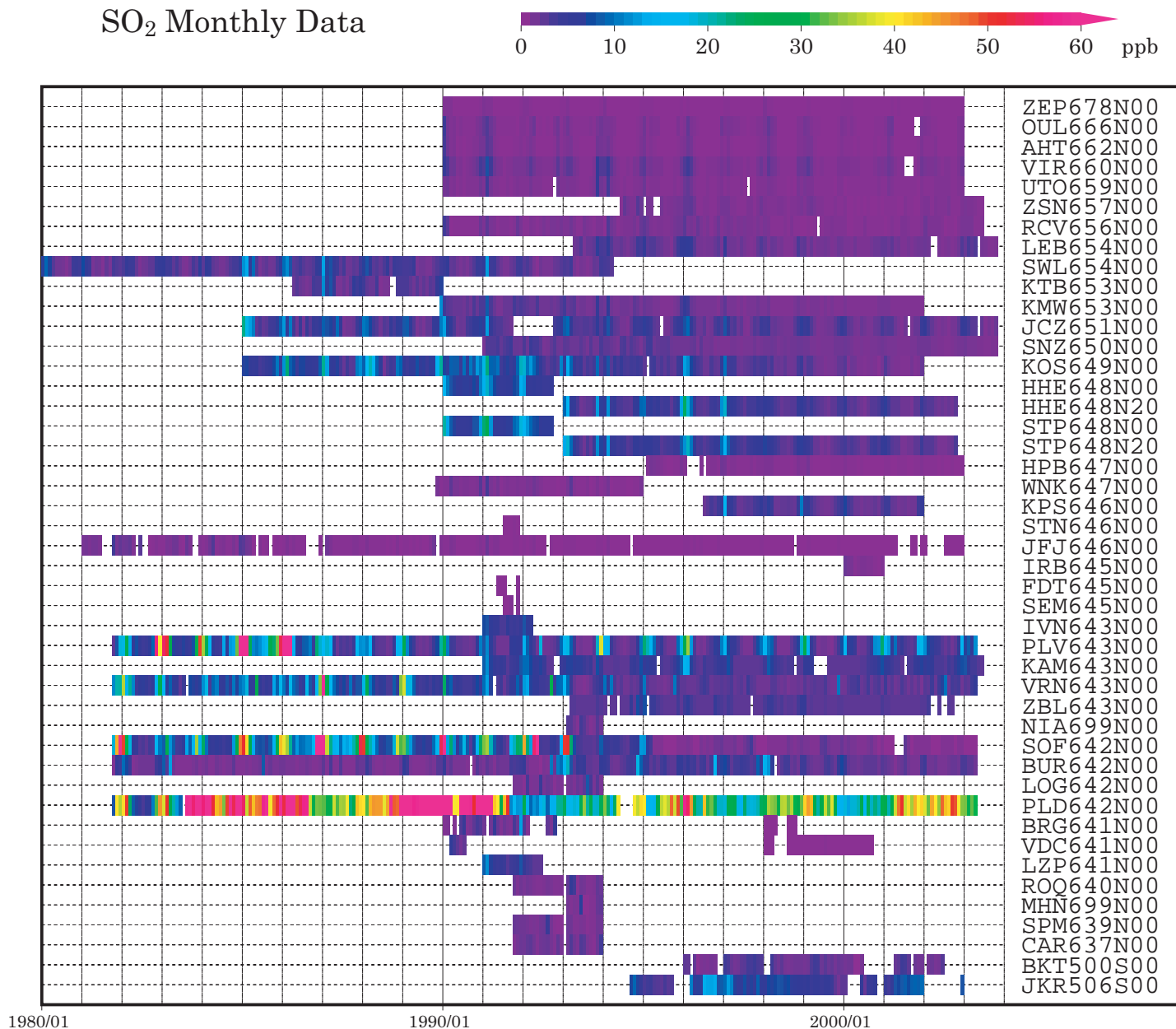


Plate 10.1 Monthly mean concentrations of SO₂ for all stations reported to the WDCGG. The stations are set from north to south.