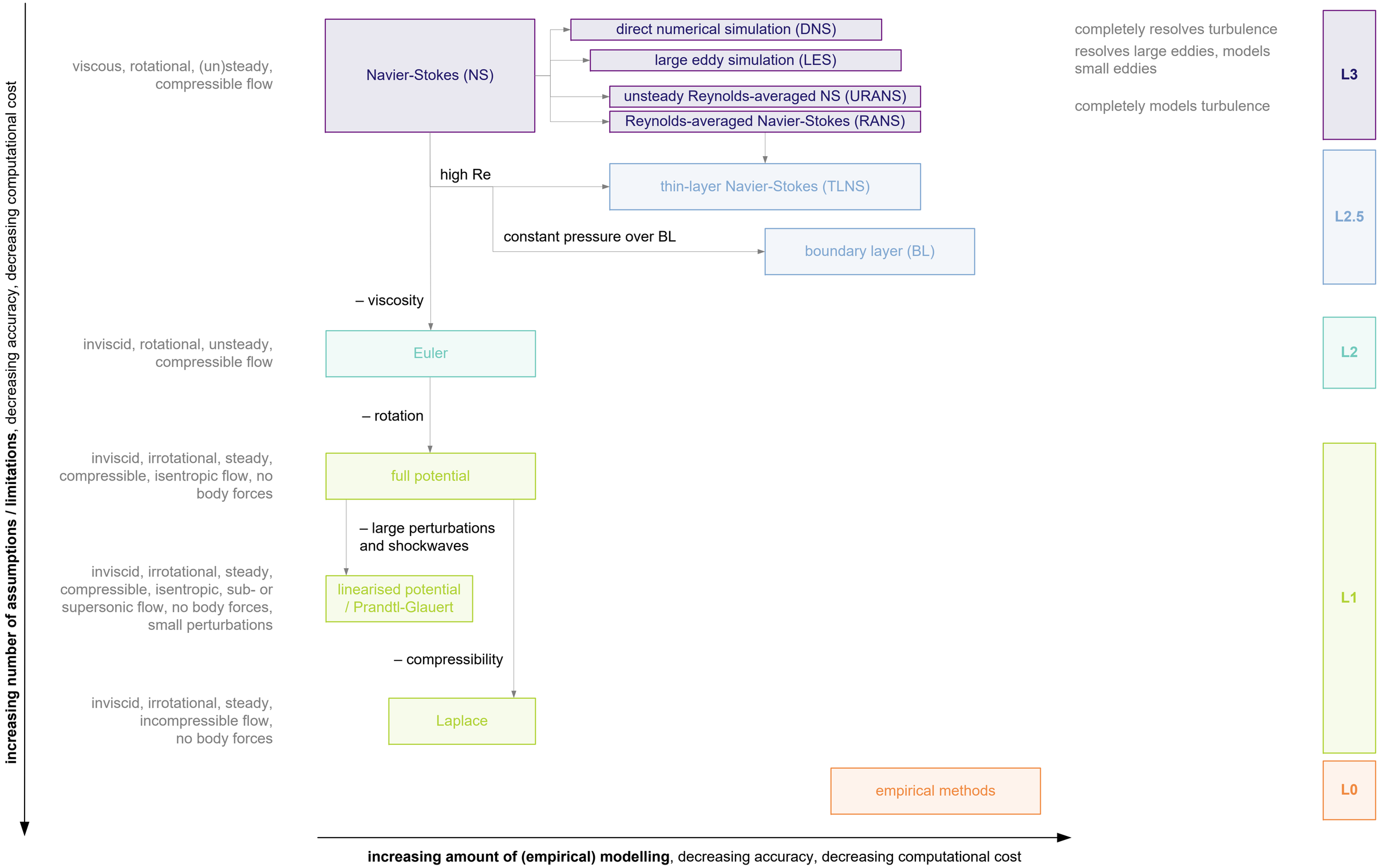
increasing number of assumptions / limitations, decreasing accuracy, decreasing computational cost
viscous, rotational, (un)steady, compressible flow
Navier-Stokes (NS)
direct numerical simulation (DNS)
large eddy simulation (LES)
unsteady Reynolds-averaged NS (URANS)
Reynolds-averaged Navier-Stokes (RANS)
completely resolves turbulence
resolves large eddies, models small eddies
completely models turbulence
L3
high Re
thin-layer Navier-Stokes (TLNS)
constant pressure over BL
boundary layer (BL)
L2.5
– viscosity
inviscid, rotational, unsteady, compressible flow
Euler
L2
– rotation
inviscid, irrotational, steady, compressible, isentropic flow, no body forces
full potential
– large perturbations and shockwaves
inviscid, irrotational, steady, compressible, isentropic, sub- or supersonic flow, no body forces, small perturbations
linearised potential / Prandtl-Glauert
L1
– compressibility
inviscid, irrotational, steady, incompressible flow, no body forces
Laplace
empirical methods
L0
increasing amount of (empirical) modelling, decreasing accuracy, decreasing computational cost