Lithospheric plates move relative to each other with velocities of several cm/year. In subduction zone, one plate slides (subducts) under the other. Slabs are being deformed while subducting to the Earth's mantle. The subduction is influenced by phase transitions of the mantle material at the depths of 410 km and 660 km. Here, we used a two-dimensional numerical model of subduction to evaluate the influence of latent heat released or absorbed during these phase transitions on the subduction process. We examined the influence of latent heat alongside the influence of other parameters - age of the slab (50 – 150 million years), yield stress inside the slab ($2 \cdot 10^8 - 5 \cdot 10^8$ Pa) and viscosity of the crust ($10^{20} - 10^{21}$ Pa s). Latent heat released during an exothermic phase transition at the depth of 410 km heats up the slab by 50 – 90 K, reduces the density anomaly with respect to the surrounding mantle and slows down the slab. At the same time, the viscosity of the slab is lowered and the slab deforms more easily in the transition zone due to the endothermic phase transition at the depth of 660 km and a viscosity resistance of a stiffer lower mantle. The stress inside a slab is therefore lowered, which may influence deep earthquakes. When it comes to the other parameters, age of the slab changes the viscosity of the slab and the depth to which the slab can subduct, yield stress influences the slab deformation geometry and viscosity of the crust mainly influences the velocity of the slab.