In incorporating the effect of atmospheric turbulence in the broadening of spectral lines, the so-called radial-tangential macroturbulence (RTM) model has been widely used for solar-type stars, which was devised from an intuitive appearance of granular velocity field of the Sun. Since this model assumes that turbulent motions are restricted to only radial and tangential directions, it has a special broadening function with notably narrow width due to the projection effect (cf. Figure 1), the validity of which has not yet been confirmed in practice.

With an aim to check whether this RTM model adequately represents the actual solar photospheric velocity field, we carried out an extensive study on the non-thermal velocity dispersion along the line-of-sight ($V_{\text{los}}$) at various points of the solar disk based on locally-averaged spectra obtained by the Domeless Solar Telescope at Hida Observatory. By comparing two kinds of theoretical $V_{\text{los}}$ vs. $\theta$ relations ($\theta$ is the angle between the surface normal and the line of sight; i.e., $\theta = 0^\circ$ at the disk center and $\theta = 90^\circ$ at the limb) predicted from the RTM model and the Gaussian macroturbulence (GM) model (Figure 2) with the observed trend (Figure 3), the following conclusion was drawn: The center-to-limb run of $V_{\text{los}}$ is simply monotonic with a slightly increasing tendency with $\theta$, which contradicts the specific trend (an appreciable peak at $\theta \sim 45^\circ$) predicted from RTM. This means that RTM is not an adequate model at least for solar-type stars, which would significantly overestimate the turbulent velocity dispersion by a factor of $\sim 2$. The classical Gaussian macroturbulence model should be more reasonable in this respect. See [1] for more details of this study.

**Figure 1**: Schematic description of the concept of radial–tangential macroturbulence, which explains why the width of the broadening function is considerably smaller than the actual velocity dispersion.

**Figure 2**: Theoretical $V_{\text{los}}$ vs. $\theta$ diagram corresponding to RTM (solid line) and GM (dashed line).

**Figure 3**: Observed $V_{\text{los}}$ vs. $\theta$ diagram for each of the line-strength classes.

**Reference**