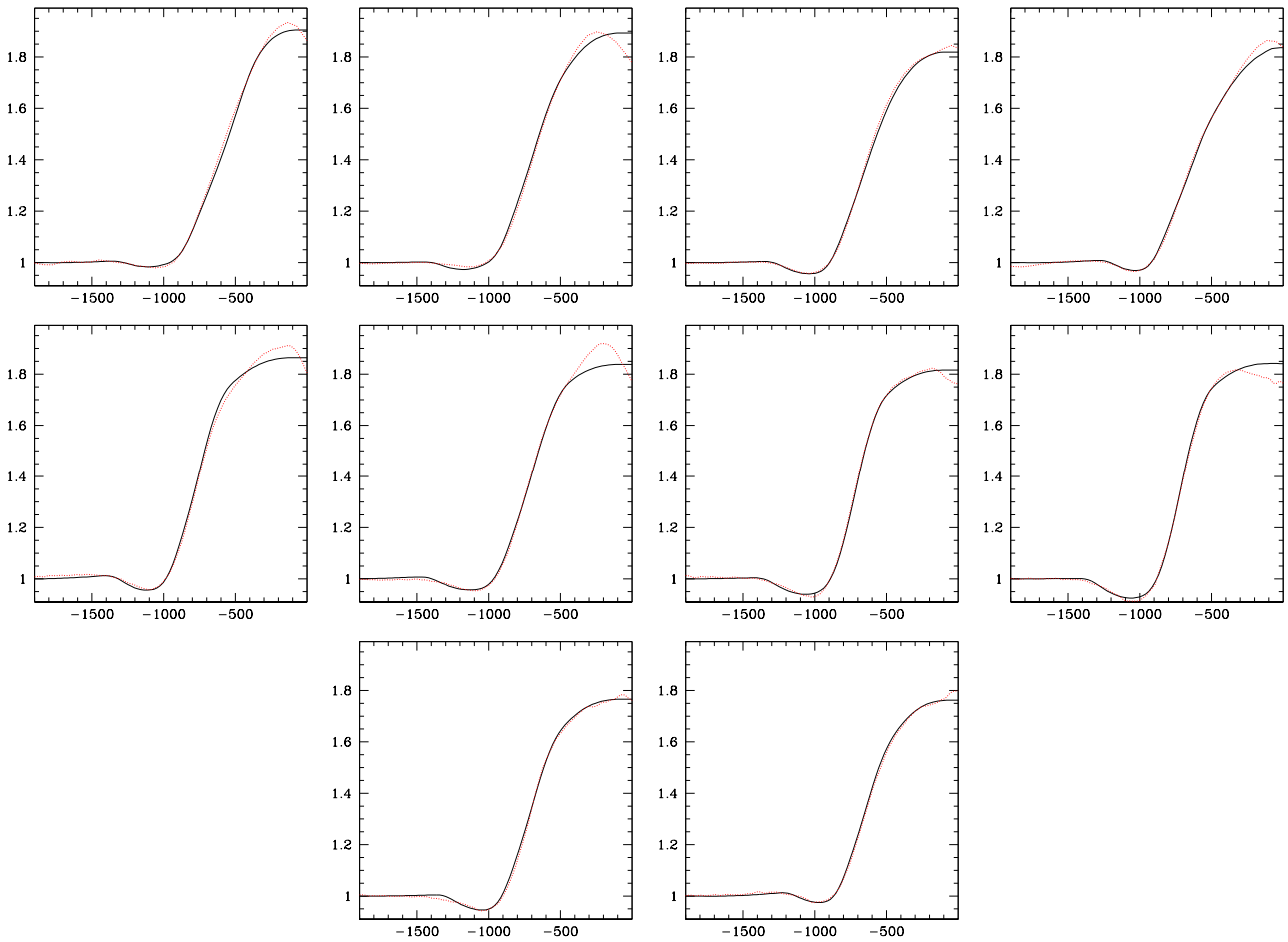

Fig. 4. Comparison of model calculations of the N V 4604 blue wing with the observations (dots) for the *strong* profiles. From left to right and from top to bottom: a, b, f, j, b27, b31, n22, n26, d03, d07. The abscissa is velocity in km s^{-1} with respect to the rest wavelength of N V 4604, the ordinate is normalized intensity. The color figure can be viewed online.

Values smaller than this lead to a sharp, blueshifted absorption component originating in the wind region that is moving at V_∞, and these absorptions are not present in the observations.

It is important to note that, with the above parameters fixed, there are different combinations of $V_{\rm max}$, X_i and R_i which lead to very similar model line profiles. Thus, the line fits of Figures 4–6 are not unique. However, once $v_{\rm th}$ is specified, $V_{\rm max}$ is constrained to values that are consistent with V_∞. Once $V_{\rm max}$ is fixed, the blue wing of the line profile is extremely sensitive to the values of X_2, X_3, R_2, and R_3 and we are unable to find different combinations of these parameters which yield the same line-profile.

The detailed shape of the P Cygni profile depends strongly on the velocity gradient and on the opacity within the accelerating region. After numerous experiments, we found it necessary to define at least three sub-regions within the accelerating region of the wind, each having different opacities. Keeping $R_{\rm max} = 4.2\ R_*$, $R_a = 3.9\ R_*$ and $v_{\rm th} = 50$ km s^{-1} constant, we fitted each line individually in an iterative manner by varying only the values of X_i, R_i and $V_{\rm max}$. As noted above, $V_{\rm max}$ is limited by the terminal wind speed, so the range of values over which it can be varied is not very broad. However, it is important to note that a small variation in $V_{\rm max}$ modifies the velocity gradient and, hence, the Sobolev optical depth. Thus, variations in $V_{\rm max}$ that are within the uncertainties of the measured V_∞ lead to noticeable differences in the line profiles.

In general, a good fit was achieved after ∼30 iterations. A second pass on the entire set of profiles, with ∼10–20 iterations each, yielded model profiles that differed from the observations within the noise