Supplemental Materials for "Spontaneous valley polarization and valley-

nonequilibrium quantum anomalous Hall effect in Janus monolayer ScBrI"

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Fig. S2 The spin-polarized band structures of ScBrI gained from GGA+U method (U values vary from 0 to 2.5 eV). The red and blue lines represent spin-up and spin-down states, respectively.



Fig. S3 The band structure of ScBrI acquired from HSE06+SOC with the magnetization direction along +Z.



Fig. S4 The energy differences between AFM and FM configurations as a function of different biaxial strains.



Fig. S5 The MAE as a function of different biaxial strains.





Fig. S6 The energy band structures of ScBrI with different biaxial compressive strains.





Fig. S7 The orbital-projected band structures of ScBrI with (a) $\varepsilon = 1\%$, (b) $\varepsilon = 1.65\%$, and (c) $\varepsilon = 2\%$. The red symbols represent the orbital components of d_{z^2} of Sc, and the blue symbols represent the orbital components of d_{xy} and $d_{x^2-y^2}$ of Sc.





Fig. S8 The Berry curvature of ScBrI in the 2D BZ with (a) ε = 1%, (b) ε = 1.65%, and (c) ε = 2%. The Berry curvature along the high symmetry points with (d) ε = 1%, (e) ε = 1.65%, and (f) ε = 2%.