$$\begin{array}{ccc}
\mathrm{Hom}_{\mathcal{C}\times\mathcal{C}}(\Delta D, (A, B)) & \xrightarrow{\eta_D} & \mathrm{Hom}_{\mathcal{C}}(D, A \times B) & \quad D \\
\Big\downarrow{\scriptstyle \mathrm{Hom}_{\mathcal{C}\times\mathcal{C}}(\Delta h, (A,B))} & & \Big\downarrow{\scriptstyle \mathrm{Hom}_{\mathcal{C}}(h, A\times B)} & \quad \Big\uparrow{\scriptstyle h} \\
\mathrm{Hom}_{\mathcal{C}\times\mathcal{C}}(\Delta C, (A, B)) & \xrightarrow{\eta_C} & \mathrm{Hom}_{\mathcal{C}}(C, A \times B) & \quad C
\end{array}$$