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Small-scale statistics of passive scalars released from concentrated sources in turbulent channel flow[1] LAURENT MYDLARSKI, EMMANUEL GERMAINE, LUCA CORTELEZZI, McGill University — In 2010, we presented complementary experimental and numerical results pertaining to the large-scale statistics of a turbulent passive scalar released downstream of a line source in fully-developed turbulent channel flow. Our latest results relate to the evolution of the scalar dissipation rate ($\varepsilon_\theta \equiv \alpha\langle(\partial\theta/\partial x_i)^2\rangle$) downstream of the line source, for two different wall-normal source locations. We present experimental and numerical PDFs of the 3 different temperature derivatives ($\partial\theta/\partial x_\gamma$), as well as the different components of ε_θ ($\varepsilon_{\theta_\gamma}$), and conditional expectations of $\varepsilon_{\theta_\gamma}$. We also examine the anisotropy of the components of $\varepsilon_{\theta_\gamma}$ and note that these can asymptote to an anisotropic final state. This is attributed to the presence of the mean velocity gradient in the channel, which induces an additional production term (in the wall-normal direction) in the ε_θ budget. However, it also appears that the degree of this final anisotropy decreases with increasing Reynolds number and proximity to the wall (the two being correlated).

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