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**Generalized quasi-geostrophic equation in the critical Lorentz-Besov space
based on the maximal regularity theorem**

We consider the quasi-geostrophic equation with its principal part $(-\Delta)^\alpha$ for $\alpha > 0$ in \mathbb{R}^n with $n \geq 2$. We show that for every initial data $\theta_0 \in \dot{B}_{r,q}^{1-2\alpha+\frac{n}{r}}$ with $1 < r < \infty$ and $1 \leq q \leq \infty$, there exists a unique solution θ in the class of maximal Lorentz-Besov regularity theorem such that $\partial_t \theta, (-\Delta)^\alpha \theta \in L^{\gamma,q}(0, T; \dot{B}_{p,1}^s)$ for $2\alpha/\gamma + n/p - s = 4\alpha - 1$ with $r \leq p < \infty$ and $s > -1$.