Lifetime Achievement Nikolai Dotzek Award 2018 for Bob Davies-Jones

The ESSL awarded Dr. Robert Davies-Jones with the Nikolai Dotzek Award for his lifetime achievement. Bob Davies-Jones is the first European to receive this prestigious award, to be presented at the upcoming ECSS in Kraków, Poland, where also the regular 2019 Nikolai Dotzek Award will be given.

Bob Davies-Jones is one of the founders of the modern theoretical description of supercell thunderstorms. Although he is perhaps best known for his contributions on supercell and tornado dynamics, he also has advanced the field of large-scale dynamics and made numerous contributions on basic fluid physics (often centered on one of the most important quantities to analyze tornadoes: vorticity).

Having a background in solar physics, Bob joined the National Severe Storms Laboratory in 1970 where, among other topics, he did research on dual-Doppler networks. The results of this research are now common knowledge and the basis of today's designs of such networks. In 1984, he authored one of the most seminal work on supercell dynamics, entitled "Streamwise Vorticity: The Origin of Updraft Rotation in Supercell Storms," which has been cited over 420 times. In that paper he derived expressions for the covariance between updraft and vertical vorticity for general wind profiles, and introduced storm-relative helicity (SRH) as a potentially useful tool to predict supercells and tornadoes. SRH is now one of the most important kinematic parameters used across the globe to identify the potential for supercells. Also in the early 1980s, he probably was the first to argue that tornadogenesis required a downdraft, or else vertical vorticity could not develop very close to the surface. This idea was further explored in an important contribution in 1993, where he and his coauthor, Harold Brooks (Nikolai Dotzek Awardee 2015), analyzed how vertical vorticity along trajectories changes sign from negative to positive while the air is still descending. This mechanism is now commonly referred to as the DJB mechanism and appears to be the most fundamental way by which real-world convective storms initially develop near-surface rotation. Further, Bob applied a vorticity decomposition theorem by J. Dutton to highly idealized flows that mimic certain storm features, for which he obtained analytical results. He was thus able to demonstrate in detail how descending air acquired positive vertical vorticity, which may subsequently be stretched to produce a tornado. He also offered in-depth analyses of linear and nonlinear propagation of supercells. Although working through Bob's papers usually takes some effort, the reader is always rewarded with a deeper understanding, and left with a sense of beauty, of storm dynamics.

Perhaps less known in the severe-storms community, Bob has also made substantial contributions in the field of synoptic-scale dynamics. By leveraging formal similarities between the Q-vector and the tilting/stretching terms of the vorticity equation, he found that the Q-vector may also be interpreted as the rate at which the vorticity associated with the thermal wind is rearranged, and identified the constraint of PV conservation as the reason that the geostrophic balance flow to destroy itself. He also obtained generalizations of the Q-vector to diagnose the 3D ageostrophic circulation, and he introduced the "alternative balance" to improve some of the shortcomings of the traditional quasigeostrophic theory.

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