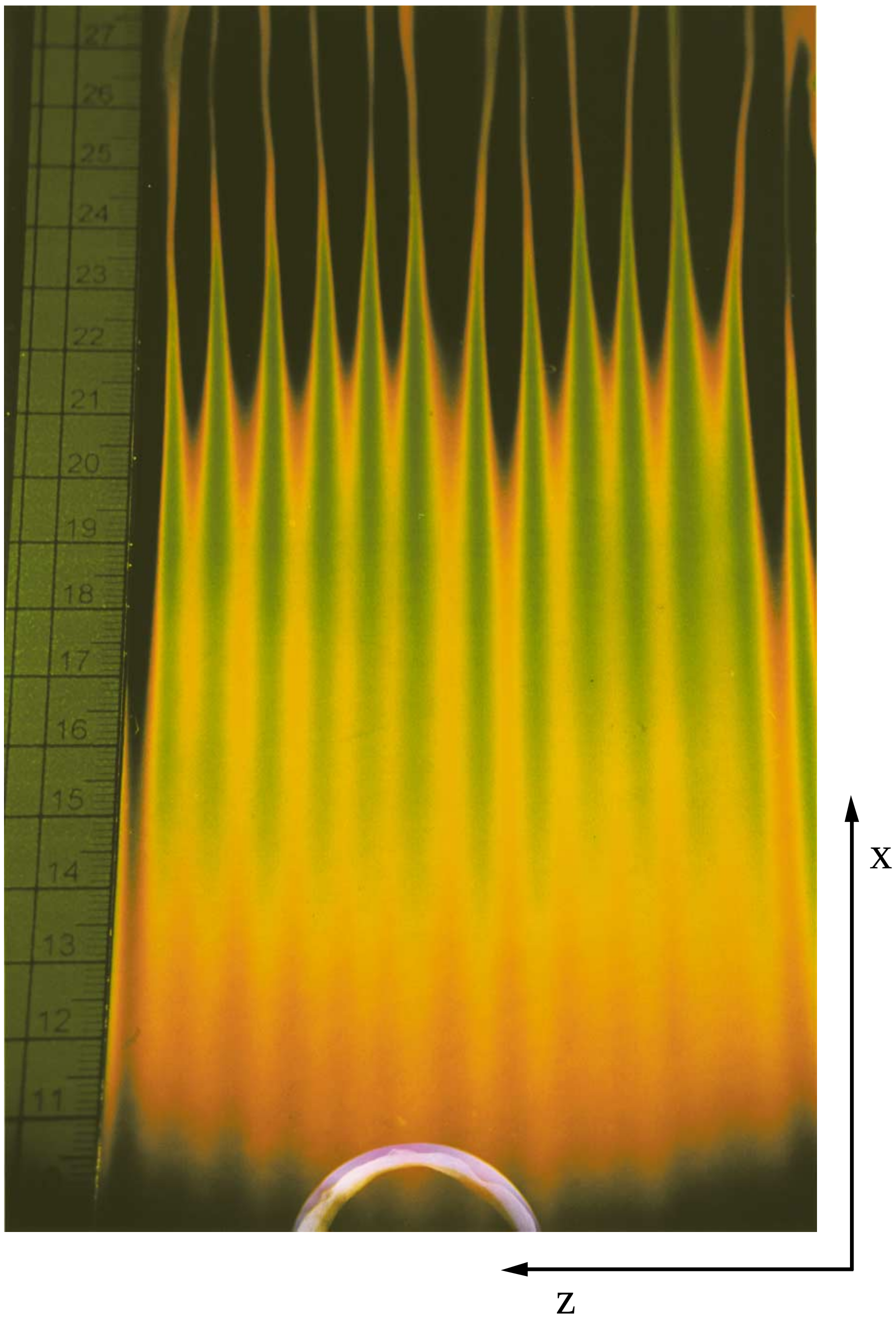
1. Wall temperatures in natural convection flow with laminar longitudinal vortices

***Jeschke, P.*[1], *Biertümpfel, R.*[2], *Beer, H.*[2],**

1) *Siemens KWU*

D-45466 Mülheim a. d. Ruhr

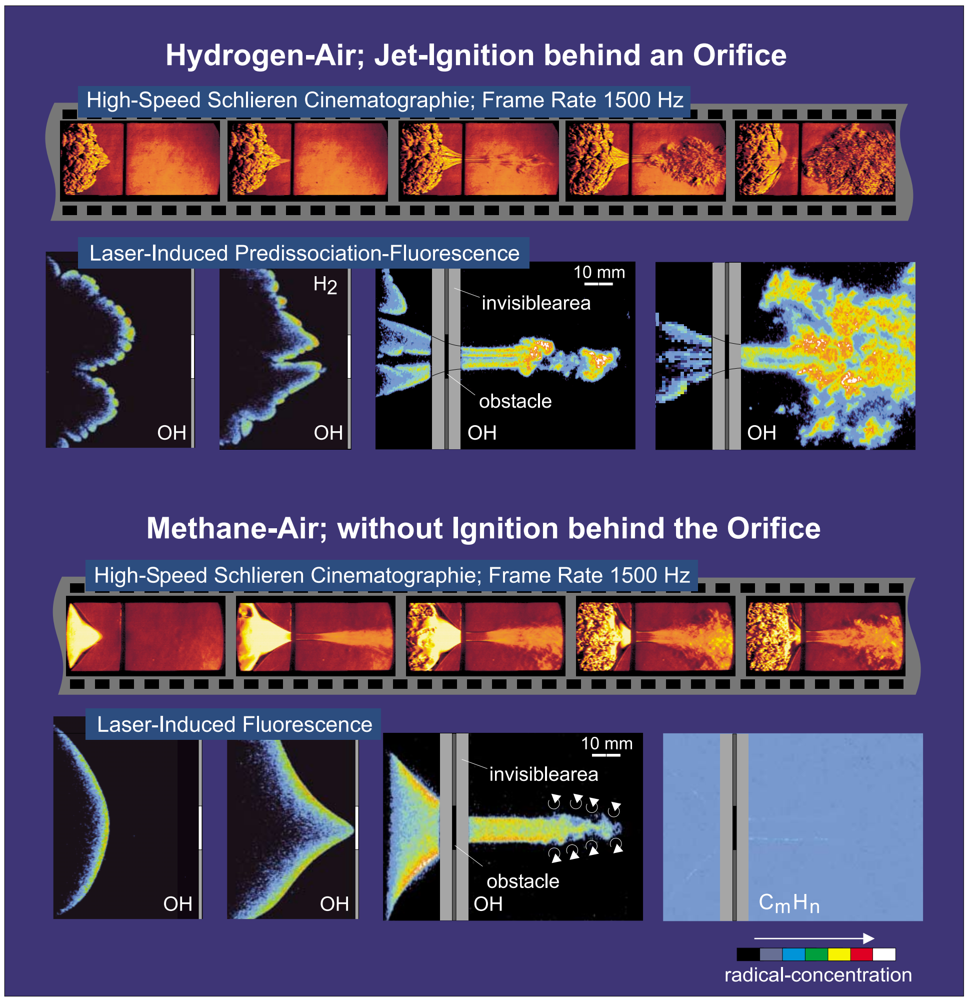
2) *Technical University Darmstadt, Institute of Technical Thermodynamics Petersenstr. 30, D-64287 Darmstadt, Germany*



TLC visualization of the surface temperatures of a heated inclined ($\gamma = 20^\circ$ against the vertical) flate plate in natural convection. The x direction is the downflow direction. The scale on the left is in centimeters and starts at the beginning of the heated plate. The laminar and longitudinal vortices produce a regular pattern of the surface temperatures in the downflow direction. The TLC change their color with rising temperatures from red to yellow, green and blue.

2. Flame Structures during Acceleration Processes

***Jordan, M.*[1], *Gerlach, C.*[1], *Edlinger, B.*[1], *and Mayinger, F.*[1]**
1) *Lehrstuhl A fiit Thermodynamik Technische Universitat München*
Tel.: +49-89-289-16202 Fax:+49-89-289-16215
e-mail : jordan@thermo-a.mw.tu-muenchen.de



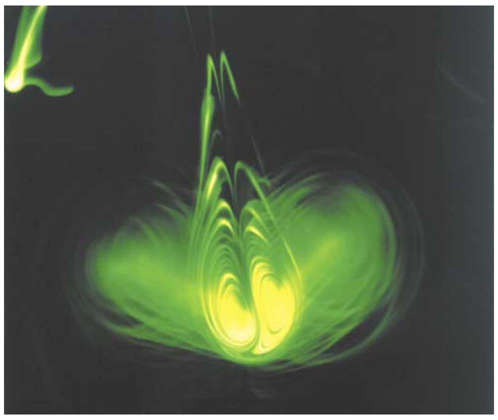
The influence of turbulence on the combustion process has been investigated by many researchers. Nevertheless, there is still a lack of reliable data concerning the structure of turbulence induced by single building-typical obstacles in front of the flame and their influence on the flame structure, the flame velocity, and therefore the resulting pressure release.

Highly sophisticated laser optical measurement techniques, such as the Laser-Doppler-Velocimetry (LDV) and the Laser-Induced Predissociation-Fluorescence (LIPF) are applied to investigate turbulent flame propagations.

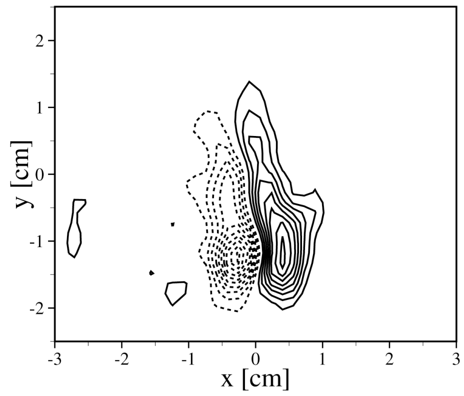
Schlieren sequences that visualise the integral density gradient of a lean hydrogen-air flame (upper row) and a stoichiometric methane-air flame (lower row) are compared to the corresponding images obtained from LIPF measurements. With this optical technique a thin layer of the flame is investigated during an exposure time of only 17 ns. Thereby, specific radicals (e. g. OH, C_mH_n,...) generated inside the reaction zone are detected.

3. Reconnection of a counterrotating vortex pair

***Leweke, T.*[1] *and Williamson, C. H. K.*[2]**
1) *IRPHE, CNRS/Universites Aix-Marseille, 12 av. General Leclerc, F-13003 Marseille, France*
2) *Mechanical & Aerospace Engineering, Cornell University, Ithaca, NY 14853-7501, USA*



(a) lew_1a



(b) lew_1b

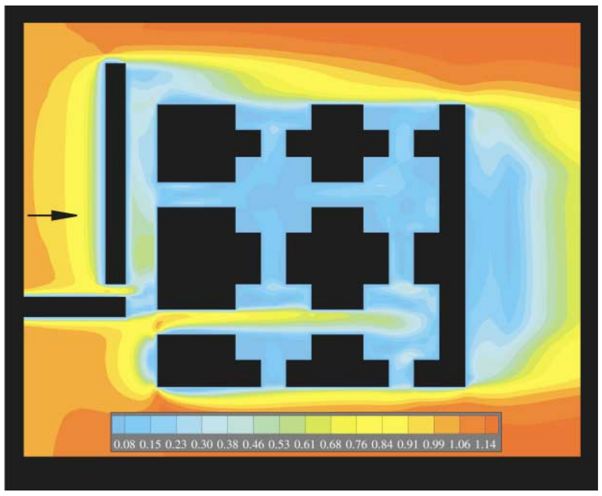
A pair of initially straight and parallel vortices is unstable to large-scale symmetric wavy perturbations (Crow instability). This figure shows the flow in a plane perpendicular to the vortex axes, at a location where the instability brings the vortices closer together. The Reynolds number based on the initial circulation is ~2000. In the dye visualization in (a), the vortex cores deform, they elongate vertically, and a tail of dye is developing behind the descending pair. In (b), the corresponding contours of vorticity (spacing 0.8/s), obtained by Particle Image Velocimetry, show that this structure indeed corresponds to a tail of vorticity. At the end of this core interaction (vortex reconnection), the pair will have evolved into a series of vortex rings.

For more information:

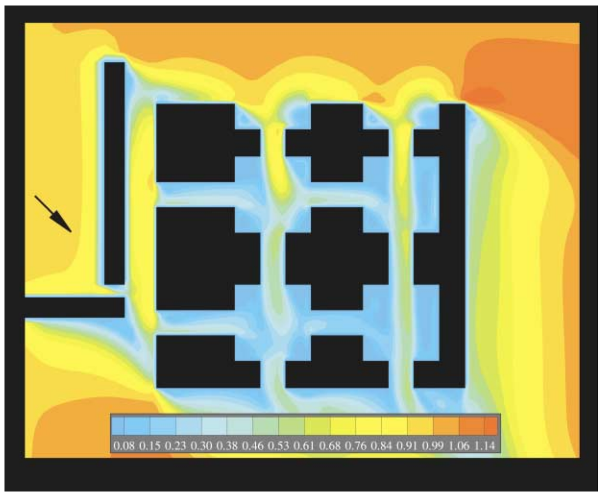
Leweke, T., Williamson, C. H. K.: "Three-dimensional dynamics of a counterrotating vortex pair", Proc. 8th International Symposium on Flow Visualization (ISBN 0-9533991-0-9), G. M. Carlomagno & I. Grant (eds.), Paper 271 (1998).

4. Simulation of three-dimensional, turbulent flow around several pavilions separated by passageways

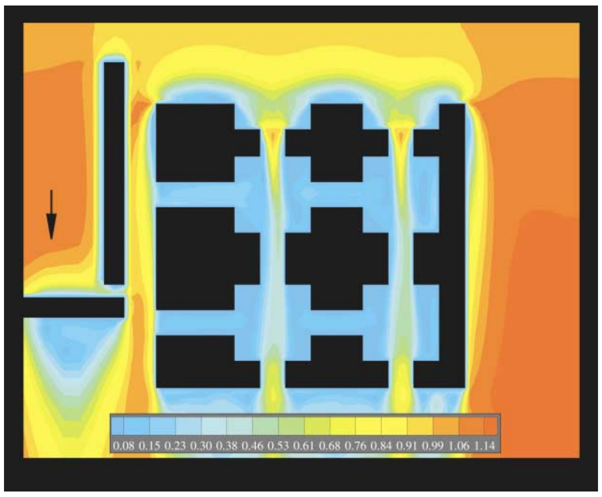
***Ferreira, A. D.*[1]*, Sousa, A. C. M* [2] *and Viegas, D. X.*[1]**
1) *Mechanical Eng. Dept., University of Coimbra-Polo II, 3030 COIMBRA, Portugal*
2) *Mechanical Eng. Dept., University of New Brunswick, Fredericton, NB, Canada E3B 5A3*



(a)



(b)



(c)

(d)

Velocity isolines for the wind flow around a group of low-rise pavilions, separated by passageways. The configuration considered represents the southern end of the EXPO '98 World Exposition area. Figures (a), (b) and (c) depict iso-contours of wind velocity for N-, NE- and E-incidence angles, respectively, at the horizontal plane z = 3m. Figure (d) exemplifies the pathlines for the wind flow around the same group of pavilions, for NE-incidence angle and for the horizontal plane z = 3m at the site. Each pathline segment represents the distance between two non-interfering particles, for a specified time interval, moving in the flow field.

The velocity field was obtained by solving numerically the 3-D equations governing mass and momentum conservation and using for the turbulence closure the RNG model. The colour map depends on the non-dimensional parameter representing the relation between local and inlet velocity magnitude, measured at the height z = 3m.

5. Simulation of a polar low over the Japan Sea

***Fu, Gang.*[1, 2]*, Niino H.*[1]*, Kimura, R.*[1]*, and Kato, T.*[3]**

1) *Ocean Research Institute, University of Tokyo, 164-8639, Tokyo, Japan*

2) *Dept. of Marine Meteorology, Ocean University of Qingdao, 266003, Qingdao, China*

3) *Meteorological Research Institute, 305-0052, Tsukuba, Japan*

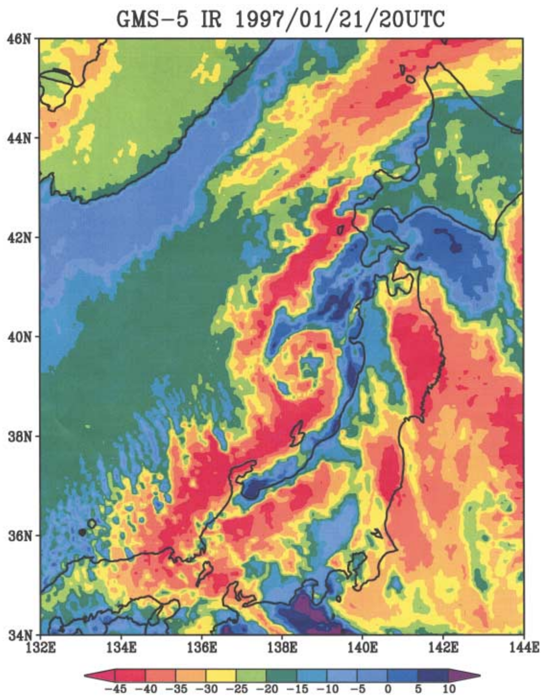


Fig.1 GMS-5 IR data at 20UTC 21 January 1997 (The original data provided by the Japan Meteorological Agency).

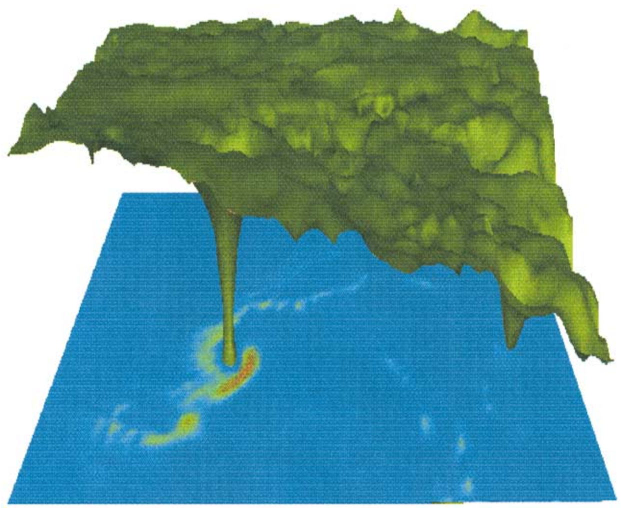


Fig.2 The simulated polar low at 18UTC 21 January 1997.

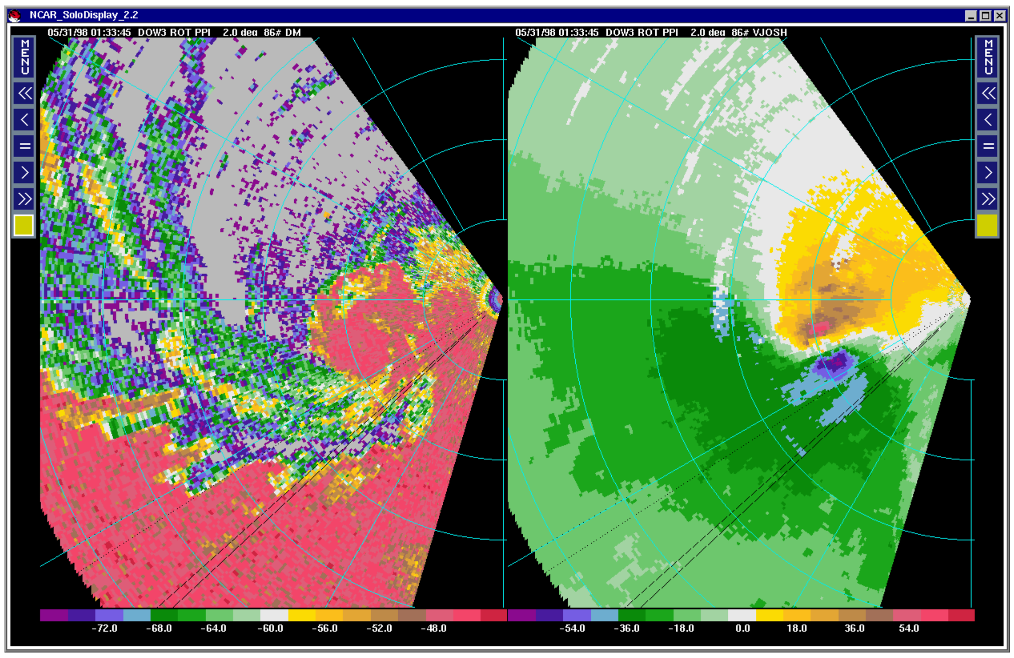
Polar lows are intense mesoscale cyclones that form in cold air streams of the polar airmass. Their horizontal scales are on the order of several hundred kilometers, and their entire life time range from several hours to several days. They usually develop in winter over the high-latitude oceans such as, the Gulf of Alaska, the Barents Sea and the Norwegian Sea. On satellite images, polar lows are frequently characterized by spiral or comma-shaped cloud patterns and are even associated with a clear “eye” structure at their mature stage. The Japan Sea is located at the lowest latitude among the oceans where polar lows frequently occur. Figure I shows a GMS-5 IR (infrared) image of a polar low over the Japan Sea at 20UTC 21 January 1997. The polar low has a remarkable spiral cloud pattern and a clear “eye” structure which are similar to those found in a typhoon*. Figure 2 presents the 3-D structure of polar low based on the simulation result of MRI-NHM (Meteorological Research Institute Non-Hydrostatic Model)** valid at 18UTC 21 January 1997. The yellow-green color represents the isentropic surface of 271.5K. The “warm core” structure near the center of the vortex is caused by adiabatic warming due to a downdraft and is clearly visualized by the funnel-like isentropic surface which almost reaches the sea surface. The horizontal distribution of the rainbow color shows snow mixing ratio q near the sea surface which corresponds well to the spiral-shaped cloud pattern and the “eye” structure as seen in the satellite picture.

* Fu, Gang, An observational and numerical study on polar lows over the Japan Sea, Ph.D thesis of the University of Tokyo, 1999.

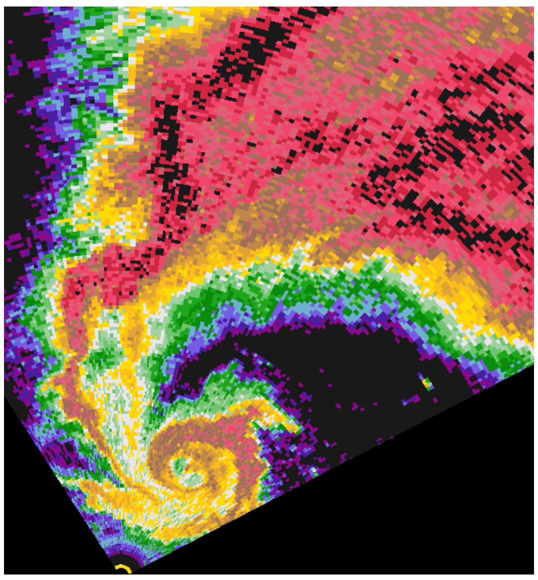
** Saito, K., Semi-implicit fully compressible version of the MRI mesoscale nonhydrostatic model — Forecast experiment of the 6 August 1993 Kagoshima Torrential Rain—, Geophys. Mag. Ser., 2 (1997), 109-139.

6. Tornadoes Observed with High Resolution Mobile Radar

Wurman, J.[1)]
1) *Scool of Meteorology, University of Oklahoma, Norman, OK U.S.A.*



Reflectivity (Left) and Doppler Velocity (Right) in strong tornado that destroyed much of Spencer, South Dakota on 30 May, 1998.



Reflectivity during tornadogenesis near Rolla, Kansas on 31 May, 1996.