Air Circulation Under Low Pressure

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Understanding of air circulation mechanisms is an important constituent for low pressure environmental control, low pressure atmospheres were suggested for Martian (Planetary) Greenhouse design (Wheeler et al., 2000) to minimize system construction materials and cost. Temperature distribution and moisture exchange (humidity level) are just two important components of environmental control which are affected by air circulation.

At the same time there are not much data and descriptions suggested for design/engineering applications of air circulation concept under low pressure.
There have been done theoretical research and experimental investigation at SLS Lab KSC NASA in 2002 - 2004, which confirmed that air circulation rate (but not wind speed) decreases with lowering of total pressure to the certain limit.
The formula suggested for practical engineering applications is:
$F = - F_m + C*(P/P_o)^{\alpha}$, where
F = forced air circulation rate, m^3/s;
P = current atmospheric pressure, kPa;
P_o = normal atmospheric pressure, $\sim$ 101,3 kPa;
α = power function coefficient varying in dependence on low pressure chamber geometry and fan power, generally takes values between $1/2$ and 3/4 ;
C = constant depending on units applied, fan power and geometry of the air flows;
F_m = minimal detectable wind-speed depending on device and measurement procedure.