Help with atmospheric water vapor partial pressure experiment.

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In an attempt to "directly" measure (first principles) the partial pressure of water vapor in air via a non−electronic or psychrometric method, I have set up an apparatus consisting of a U− tube manometer and a Salvason tube (I hope that's the correct terminology; it's a relatively large, glass, cylindrical, test tube shaped device with an open mouth at one end and a tubing nipple at the other; about 25cm tall, 2.5cm in diameter, with a total volume capacity of 410cc) The tubing nipple of the Salvason tube is connected to one leg of the water manometer; the other leg of the manometer is exposed to atmosphere. The Salvason tube is half filled with pure water and then a piece of filter paper (of the drip coffee filter variety) is pulled tight over the mouth of the Salvason tube and secured with elastic bands. The tube is then inverted (mouth down) and placed on a ring stand such that the now wet filter paper is exposed to the breeze of a small muffin fan (blowing upwards) located at the bottom of the ring stand. My idea is that the steady state differential pressure of the filter paper, as indicated on the manometer, (once the water column differential of the Salvason tube is subtracted from the total indicated differential on the manometer) will be equivalent to the difference between the saturation vapor pressure at the prevailing dry bulb temperature (the liquid water in the Salvason tube is at prevailing dry bulb temperature) and the prevailing partial pressure of water vapor in the air in which the apparatus is located. So far, my apparatus looks promising. Conditions are: Tair=25C, RH=52%, Pwater vapor= 16.3cm H20, Psat H2O in Salveson=31.3 cm H20. Target dP=31.3−16.3=15.0 cm H20. I get to within about 1.5 cm of water column of my predicted, namely 15.0 cm of differential, before air (tiny bubbles) starts to penetrate the filter membrane; stopping the partial vacuum in the top of the Salvason from developing further. But the rate trend, as I approach my 15.0 cm on the filter membrane seems to indicate that I am on the right track, ie, the rate of pressure in the Salvason drops more slowly (it follows that the evaporation rate from the surface of the filter membrane also slows) as the 15.0 cm target is approached. Is my thinking correct? If I could stop the air from crossing the filter membrane, would the dP across the filter paper likely stabilize and be equal to the difference between the saturation vapor pressure and the prevailing partial pressure of water vapor in the air? In other words; would evaporation from the filter paper cease?
Thanks for any constructive advice...

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