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1171 STATEMENT OF DR. DANIEL L. ALBRITTON DIRECTOR, AERONOMY  
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1175 Dr. ALBRITTON. Thank you, Mr. Chairman, members of the  
1176 Subcommittee.

1177 My name is Dan Albritton. I'm director of NOAA's Aeronomy  
1178 Laboratory in Boulder, Colorado.

1179 For over 30 years, our laboratory has studied atmospheric  
1180 chemistry, including the chemistry of the ozone layer.

1181 In addition, in the past several years, I've served as  
1182 co-chair, along with my colleague, Dr. Watson, of the Ozone  
1183 Science Assessment Panel of the United Nations Environment  
1184 Program.

1185 Our job there has been to coordinate the preparation of  
1186 the scientific assessments of the world-wide ozone science  
1187 community.

1188 In these two capacities, I certainly appreciate the  
1189 invitation to appear before the Subcommittee and to  
1190 summarize the current understanding that the world-wide  
1191 ozone community has of ozone depletion.

1192 Let me underscore right at the outset that the summary  
1193 that I'm about to give you is not my own assessment. It is  
1194 indeed the statement of the vast majority of the active and

1195 practicing world's ozone researchers regarding the current  
1196 state of understanding of ozone depletion based upon their  
1197 own results and their own laboratories, their field  
1198 observations and their atmospheric monitoring and their  
1199 theoretical modelling.

1200 As part of the advice to world government's on the ozone  
1201 layer, this ozone community has prepared a series of such  
1202 state of understanding assessments.

1203 In 1985, they prepared this summary, which was used as  
1204 input by governments for decisions under the Montreal  
1205 Protocol in 1987.

1206 In 1989, they updated their ozone understanding for the  
1207 discussions of governments in the London Amendment in 1990.

1208 And in 1991, they updated it further to describe the new  
1209 findings over the last years. And that was input to the  
1210 Copenhagen Amendments in 1992.

1211 And now, as you have already cited, the world science  
1212 community has summarized a current viewpoint on ozone  
1213 depletion and its executive summary is the article in the  
1214 short book that you have as part of your package.

1215 These periodic assessments by the community have been  
1216 deemed to have very high value. They are, first of all,  
1217 scientific documents. They're based upon the published  
1218 extensive scientific literature read by colleagues  
1219 world-wide.

1220           Therefore, they are a solid basis for decision-making, in  
1221 contrast to anecdotal statements or privately published  
1222 viewpoints.

1223           They are pure science. The community makes no policy  
1224 recommendations. That's the job of others, like yourselves,  
1225 that are entrusted with the public welfare.

1226           Secondly, these are majority statements. In fact, the  
1227 very, very vast majority. This assessment was prepared by  
1228 250 scientists world-wide and peer-reviewed by 150 others.

1229           It's therefore a touchstone of the opinion of the large  
1230 community. This is in contrast to the sporadic and separate  
1231 statements reflecting the opinions of either one person or a  
1232 small group of individuals.

1233           <sup>Thirdly</sup>~~Fourthly~~, it's an international assessment and it draws  
1234 from the world scientific community--all nations, all  
1235 viewpoints, and therefore, international problems can be  
1236 addressed on a common playing field.

1237           And finally, the scientific scope is comprehensive. Both  
1238 the natural changes in ozone and the human-induced changes  
1239 in ozone are considered together. And that's much more  
1240 comprehensive than a single statement about a single  
1241 observation or a single publication.

1242           Let me indicate to you the four key conclusions from this.  
1243 And I'll do it in a graphical form to supplement the points  
1244 that my colleague, Dr. Watson, mentioned.

1245           The first point is that very large seasonal depletions of  
1246 the ozone layer continue year after year to be observed in  
1247 Antarctica. 40 years of Antarctic ozone data records show  
1248 that this began in the '70s and has grown larger since then.

1249           This first chart shows the normal ozone layer as the solid  
1250 line and the dashed line shows what's happened during the  
1251 ozone hole. The hatched area indicates the ozone that's  
1252 lost over Antarctica every year.

1253           As Dr. Watson mentioned, the cause of this is certain.  
1254 It's the anthropogenic man-made compounds of chlorine and  
1255 bromine, in combination with the special conditions of  
1256 Antarctica, that has accelerated the ozone depletion there,  
1257 in contrast to elsewhere.

1258           Mr. ROHRBACHER. Dr. Albritton, could I just stop you  
1259 right there for one second? I want to clarify that point.

1260           Dr. ALBRITTON. Certainly.

1261           Mr. ROHRBACHER. You're saying that the natural--you just  
1262 said it was caused by man-made.

1263           Dr. ALBRITTON. That's right.

1264           Mr. ROHRBACHER. You're suggesting, then, that natural  
1265 causes do not contribute to this?

1266           Dr. ALBRITTON. Natural causes are not the source of the  
1267 downward trend and growing size of the ozone hole year by  
1268 year.

1269           Mr. ROHRBACHER. Okay. Thank you.

1270 Dr. ALBRITTON. The evidence for this are direct  
1271 observations that the ozone-depleting compounds are 100  
1272 times larger in Antarctica than one would expect without the  
1273 special conditions of Antarctica and the chlorine there.

1274 Secondly, in every place that these compounds are high,  
1275 ozone is low.

1276 And thirdly, that these ozone losses and high depleting  
1277 compounds appear in the presence of the ice particles that  
1278 accelerate the chlorine effect in Antarctica.

1279 The second point I wanted to underscore visually with you  
1280 is that ozone depletion continues to be observed by the eye  
1281 over much of the globe.

1282 The second chart shows how the ozone levels have changed  
1283 over the past 30 years of observations from the ground-based  
1284 network. The top box gives the raw data that these  
1285 instruments take, and in that you can see the very clear,  
1286 reproducible, ↩

1287 ↩ year-by-year annual cycle of ozone simply because, like much  
1288 of the planet, ozone depends in part on solar activity.

1289 The lower panel shows the data after this well-known  
1290 annual cycle and other variations of natural causes like  
1291 solar activity and dynamics have been taken out.

1292 My point is, regardless of which one you look at, the  
1293 downward trend of the last 15 years is clear.

1294 The third point that I wanted to underscore with you is

1295 that when ozone is depleted above, ultraviolet radiation  
1296 increases at the surface.

1297 The third chart shows data taken over long time periods  
1298 that indicate that any time ozone goes down, as you move  
1299 toward the left, that ultraviolet radiation goes up. And  
1300 those changes are very close to what one would expect from  
1301 the scattering of ultra-violet radiation and the absorption  
1302 by ozone. And therefore, it is an absolute certainty that if  
1303 one reduces ozone overhead, you will increase the  
1304 ultra-violet radiation at the surface.

1305 The final point I wanted to make is looking ahead to the  
1306 future.

1307 Point number four. The maximum ozone losses will likely  
1308 occur in the next ten years, and thereafter, our ozone layer  
1309 will slowly recover. And let me explain what I mean by that.

1310 This chart shows what has been. It also shows what might  
1311 have occurred. And thirdly, it shows what is now anticipated  
1312 if compliance with our international agreements is  
1313 maintained.

1314 In particular, solid curve on the left shows the observed  
1315 and measured growth of the ozone depleters since 1950 up  
1316 until present.

1317 That means the burden of atmospheric chlorine has  
1318 increased four times over the natural levels. If there had  
1319 been no agreed-upon change in the production of those, the

1320 upper dotted curve indicates how chlorine would have grown  
1321 in the atmosphere had there been no Montreal Protocol.

1322 And finally, the dashed curve on the lower bottom scale on  
1323 the right indicates what one would expect for atmospheric  
1324 chlorine if there is full compliance with agreements that  
1325 are to date.

1326 Notice that that recovery is slow, and this is a very  
1327 crucial point--that once placed in the atmosphere, CFCs and  
1328 other compounds live a very long time. They outlive us. And  
1329 therefore, even if decisions are made now, the recovery  
1330 takes a very long time. And this indicates the <sup>implications</sup> ~~point~~ that if  
1331 one waits <sup>until</sup> ~~the~~ larger effects on downward ozone trend are  
1332 observed to take any actions or to have reversed actions.

1333 It implies that the consequences ~~of that~~ will continue  
1334 well into the next century.

1335 In summary, Mr. Chairman, let me just note that this  
1336 hearing actually began about 20 years ago, when scientists  
1337 recognized the possibility that our own actions could  
1338 inadvertently effect the ozone layer. And over that period,  
1339 some of the world's brightest and most productive  
1340 atmospheric scientists have sharpened the picture of that  
1341 initial point.

1342 Several of those scientists are in the U.S. National  
1343 Academy of Sciences because of their ozone research. They  
1344 have focused on understanding that problem and they have

1345 | focused on telling you and others their story based on the  
1346 | world-wide opinion of scientists.

1347 |         And so I conclude by noting that while I am speaking for  
1348 | then, it is the world-wide ozone research community that you  
1349 | just heard from.

1350 |         Thank you, sir.

1351 |         Mr. ROHRBACHER. Dr. Albritton, I appreciate your fine  
1352 | testimony today and the testimony we've heard.

1353 |         I would suggest to our members that we go and vote and we  
1354 | come immediately back after the vote and then we will hear  
1355 | the next testimony and finish up the panel and then go into  
1356 | the question period.

1357 |         So we are in recess for ten minutes.

1358 |         [Recess.]

1359 |         Mr. ROHRBACHER. Ladies and gentlemen, we will move  
1360 | along. We will proceed.

1361 |         Dr. Watson, I want you to know that I am never concerned  
1362 | with people with beards who aggressively make their case.

1363 |         [Laughter.]

1364 |         Dr. Baliunas?

1365 |         [The complete statement of Dr. Albritton follows:]

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1367 | \*\*\*\*\*INSERT\*\*\*\*\*