GEOSCIENCES HELP TO PROTECT HUMAN HEALTH: ESTIMATION OF ADSORBED RADIATION DOSES WHILE FLIGHT JOURNEYS AS IMPORTANT STEP TO RADIATION RISK ASSESSMENT
Chernov A., Shabatura O.
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Amount of solar radiation in dependence from longitude of the Earth

ALGORITHM FOR RADIATION EVALUATION

DISTRIBUTION OF DIRECT SOLAR RADIATION

\[ Q_d = \frac{a}{h^2} - \frac{b}{h}\]

DISTRIBUTION OF DIRECT SOLAR RADIATION AS A FUNCTION OF CLOUDINESS FACTOR (a, b, c)

\[ Q_d = Q_{0D} (1 - c_{aw-h})\]

DISTRIBUTION OF TOTAL DIRECT SOLAR RADIATION AS A FUNCTION OF LATITUDE (\(\phi\))

\[ Q_{0D} = Q_{0D} (1 - \sin \phi)\]

DISTRIBUTION OF TOTAL SOLAR RADIATION DURING THE DAY (t, time of sunrise; t_f, time of maximum solar activity; t_s, time of sunset)

\[ Q_{0D}(t) = Q_{0D} (1 - \sin \frac{t - t_f}{t_s} \sin \frac{t_f - t}{t_s})\]

\[ Q_{0D} = \sum_{n=1}^{24} Q_{0D}(n)\]

ADSORBED DOSES FROM SOLAR RADIATION

\[ D_s = \frac{1}{A_{m} A_{p}} \int_{0}^{t} Q_{0D}(t) dt\]

ADSORBED DOSES FROM SOURCES OF RADIATION WITH HETEROGENEOUS PARAMETERS (cosmic radiation)

\[ D_s = \sum_{i} \frac{1}{A_{m} A_{p}} \int_{0}^{t} Q_{0D}(t) dt\]

CONCLUSIONS

According to the shown results, FLIGHT JOURNEYS ARE SAFE FOR PEOPLE, who spend less than 800 hours per year in flight on height from 6000 m above Earth surface and fly while stable solar activity. BUT FLIGHT JOURNEYS COULD BE DANGEROUS FOR HEALTH if human spend more than 800 hours per year in flight on height from 6000 m above Earth surface and fly with increased solar activity (solar storms, annual and diurnal periods of highest solar radiation).

Proposed steps of RADIATION COMPONENTS EVALUATION will allow to predict amount of possible absorbed doses for passengers and crew while flight journeys and PREVENT OVEREXPOSURE OF PEOPLE.

Unfortunately there is not enough available for authors precise information about components to create working algorithms for exact predictions.

Acknowledgments

http://iftistory.ru
http://INCROnline.org

Fig. 1 Space
Fig. 2 The Sun
Fig. 3 Solar radiation on the Earth

DATA FROM PERSONAL DOSIMETER

10 microseverts/hour
10 km
5 microseverts/hour
15 km

Collective dose per year during flight journeys may be compared with doses from nuclear fuel cycle BUT !!!

On altitude 12-20 km over sea level adsorbed dose is 5-13 mkrad per hour

Should we risk assessment of radiation level while flight journeys

Our investigations show, that radiation doses could be dangerous for people, who spend more than 600 hours per year in flight on height from 10 km and in periods of normal solar activity. Also passengers and flight crew can absorb more doses while journeys during more active solar radiation (solar storms, highest solar activity during the day).

Special algorithm for radiation evaluation is proposed, in which latitude, duration of flight, geographical position, meteorological conditions and solar activity variations are taken into consideration.

Solar radiation not stable during the year. In different seasons different parts of the Earth are irradiated not equally.

Dependence of solar radiation from period of the year

Table 1: Solar energy dependence from longitude

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<tr>
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On Chart 5 it is shown that solar radiation is higher during flight Kyiv-Prague than during flight Kyiv-Dubai, but according to the information on table 1, it should be vice versa. That effect occur, because flight Kyiv-Prague was during the period higher solar activity - midday and flight Kyiv-Dubai was during the evening - lower solar activity.

That example shows, that period of the day is more influential factor on amount of radiation, than longitude.

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