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The Modified Version of t_0 Method

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Abstract

The article refers to the modified variant of the well known method of t_0. It is shown that if there exists one complete hodograph and oncoming hodograph is not complete, but with its help the apparent speed can be calculated. In this case it is possible to build the refractive border with adequate accuracy and to determine its parameters.

The study of deep structure of the Earth is an important goal during the prospecting on oil, gas, ore, hydrological or regional researches. During these researches the Physical characters of various borders are studied, the contacts, tectonic disturbances, ore bodies are revealed, also the depths of deposition of existing borders and the strength of the zone of weathering is determined.

Following seismic methods are used for solution of this objectives: the Method of Reflective Waves (MRW), the Method of General Deep Point (MGDP), the Correlative Method of Refractive Waves (CMRW), the Method of Exchanging Progressing Waves (MEPW), and the Deep Seismic Zondage (DSZ).

In some cases, because of the character of the border, the most detailed and accurate methods - MRW and MGDP do not allow reliable prospecting of the reflective border. Even in the case of reliable registration of reflective waves only the geometry of borders are researched. DSZ allows to research deep layers and the speed with very low accuracy, which is caused by the usage of low frequencies and small detail of the monitoring systems.

The method which gives the most accurate determination of refractive borders and the speed of the distribution of waves in these borders is CMRW, but it cannot settle all objectives listed above, also it does not work with the enough accuracy everywhere. This is caused by: 1. inadequate readiness of physical basis of the method; 2. Sometimes the complex relief hampers to receive the high level field information.

There are various level difficulty and accuracy techniques of building of refractive borders. One of the ways for determination of refractive borders is the method t_0. This method allows to define the refractive borders with enough high accuracy and reliably and to calculate the speed of the distribution of waves. For this method both branches of the hodograph (straight and reverse) are needed which are connected by the reciprocal spot T.

In this article we want to show that the refractive border can be defined with enough accuracy and reliably, if we have only one complete hodograph and the other one is not complete but it can calculate the apparent speed.

Supposedly we have a two-layer environment. Lets specify the speed of spreading of resilient waves in the upper layer with $V_1$and in the lower one V_2. The angle of inclining of the border is specified by I φ and straight and reverse hodographs with t^+ and t^- and the apparent speeds which are defined by them accordingly will be V^+ and V^-. h and h_x are deep beddings refractive border under the points of explosions O and O_1. With the help of these values lets calculate t_{01}, t_{02} and t_0.

t_{01} =2h cos i /V_1

h_x =h+x sin φ; $V^+ = V_1/\sin(i+\varphi)$; $V^- = V_1/\sin(i-\varphi)$;

t_{o2}=2(h+x sin φ) cos i /V_1=2h cos i /V_1+2x cos i sin φ /V_1= t_{01}+x/V_1(2cos i sin φ) =

= t_{o1}+x/V_1[sin (i+ φ)- sin (i- φ)]=t_{01}+x/V^+ -x/V^- = t-x/V^-

Analogously - t_{01}= t-x/ V^+

And now let's calculate t_0

t_0= t-x/V_2=t_{01}+x/V^+-x/V_2=2h cos i /V_1+x sin (1+ φ)/ V_1-x(V^++V)/(V^+ · V)= 2hcosi /V_1+x sin (1+ φ)/ V_1- x sin i cos φ /V_1= 2hcos i /V_1+x sin φ cos i/V_1

Accordingly:

t_0=2hcos i /V_1+x sin cos i/V_1=(t_{01} + t_{02})/2

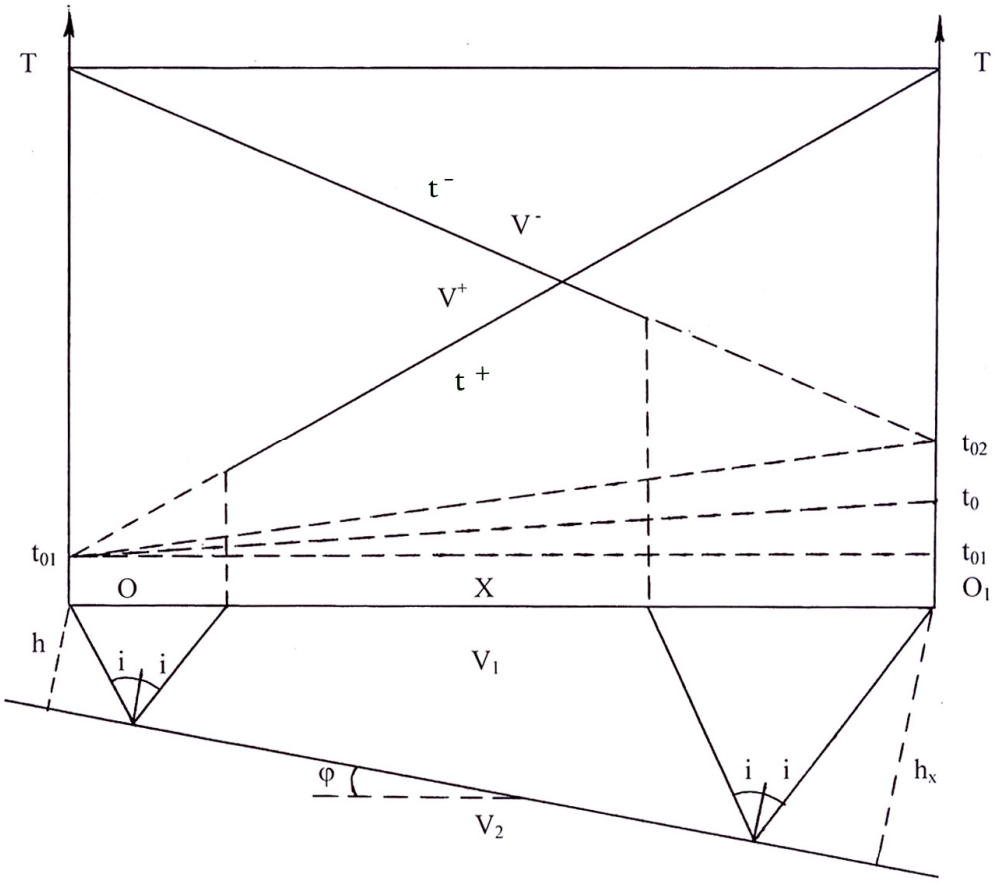

Fig. 1

The result is following: if we have full hodographs (straight and reverse), for finding the spot t_o the straight hodograph (t^+) is processed by apparent speed which is calculated by the reverse (t^-) hodograph (speed V), and on the contrary - the reverse hodograph is processed by speed V^+,

which is calculated by the straight hodograph. t_o is received from the averaging of the value t_{01} and t_{02}, accordingly - $t_o = (t_{01} + t_{02})/2$.

If we have only one hodograph and the finding of the apparent speed is possible with the help of another (not complete) one, in this case the separation of refractive border and the calculation of the apparent speed in the border layer is also possible.

This result is important for the country like Georgia, which is characterized by the complex relief and high agrarian field compactness, what as usual does not support the process of receiving of good field results.

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t_0-is modificirebuli meTodi

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statiaSi ganxilulia cnobili meTodis t_0-is modificirebuli varianti. naCvenebia, rom Tu gvaqvs erTi sruli hodografi, xolo misi Semxvedri hodografi arasrulia, magram misi saSualebiT SesaZlebelia moCvenebiTi siCqaris gamoTvla, maSin gveZleva saSualeba sakmao sizustiT davadginoT gardamtexi zedapiris Cawolis siRrme da ganvsazRvroT misi parametrebi.

Модифицированный метод t_0

Давид Китовани

В статье рассматривается модифицированный вариант известного метода t_0 . Показано, что если имеется один полный годограф, а встречный годограф неполный, но с его помощью можно вычислить кажущуюся скорость, то в этом случае возможно с достаточной точностью построить преломляющую границу и определить ее параметры.